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FOOD INDUSTRIES

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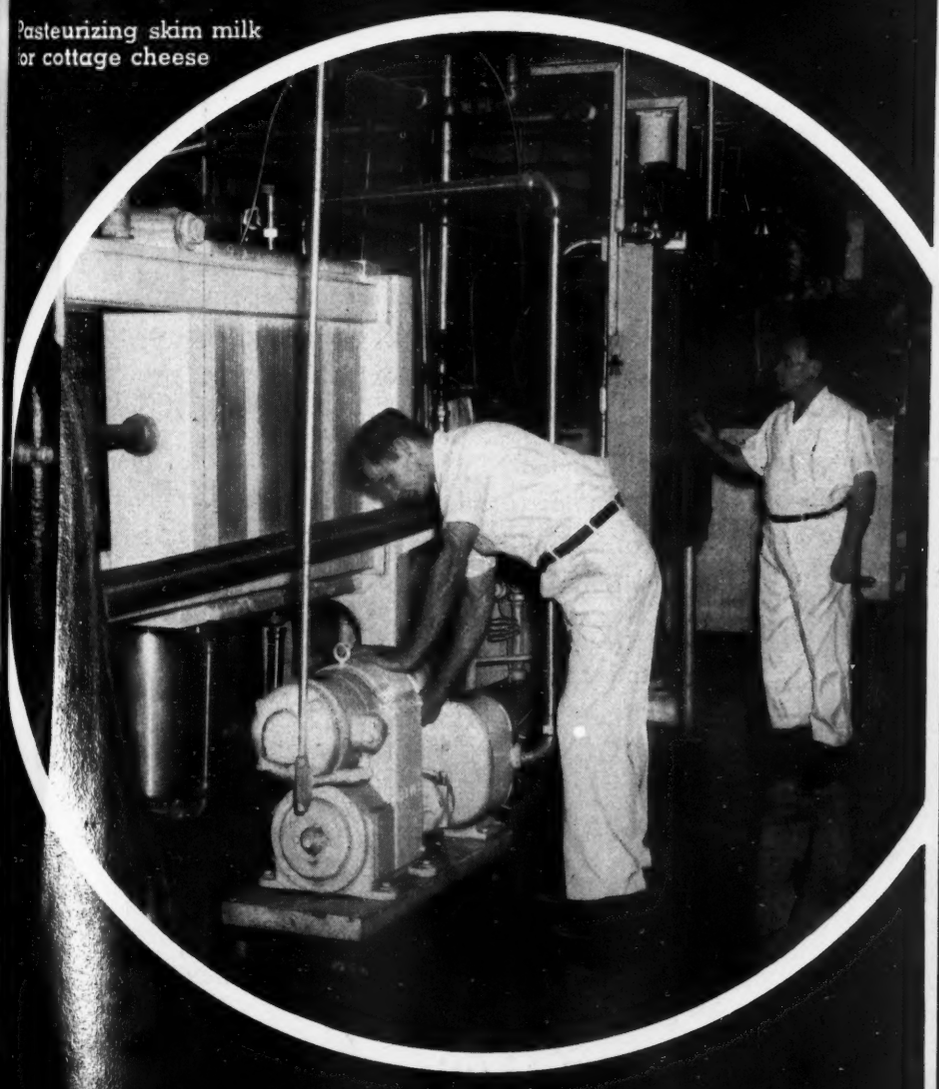

Pasteurizing skim milk for cottage cheese

OCTOBER 1948

WEIGHT CONTROL —FI Report

Revolutionary Evaporator Details

Candy Packaging With New Machines

Pea Canning Plant Uses Gravity Flow

Getting Vitamins at The Grocery Store

Tips on Acid-Type Fresh Cheeses

Frozen Dinners— Meat Packer's View

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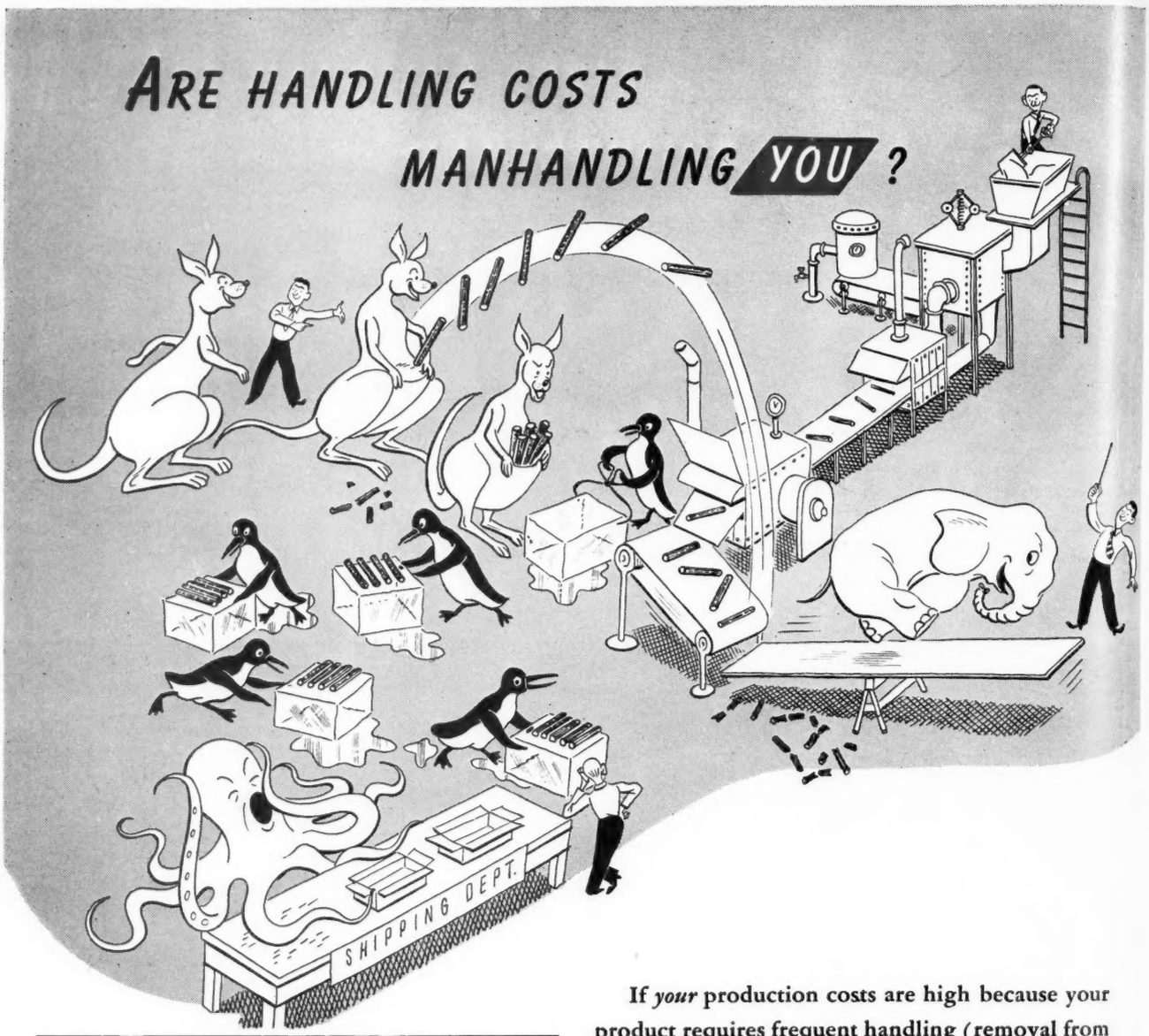

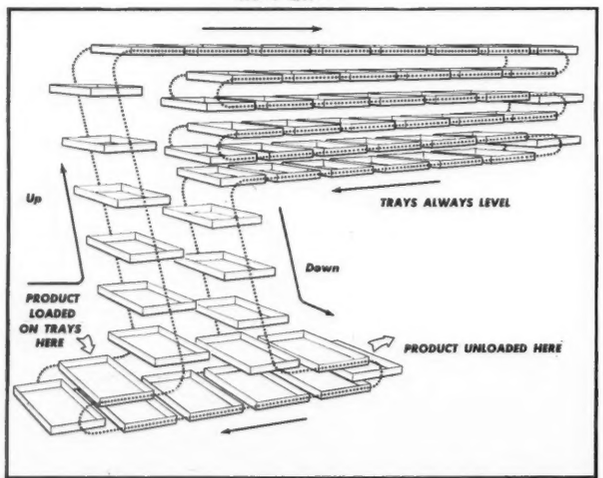

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FOOD INDUSTRIES

OCTOBER, 1948 Volume 20, Number 10

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THE COVER—Modern plate unit used to pasteurize skim milk for cottage cheese manufacture in plant of Sante Foods, Inc., Goshen, N. Y. Temperature (161½ deg. F.) and holding time (24 sec.) are controlled automatically by instruments mounted on panel board in rear. For additional photographs and "Tips" on the making of soft cheeses see page 122.

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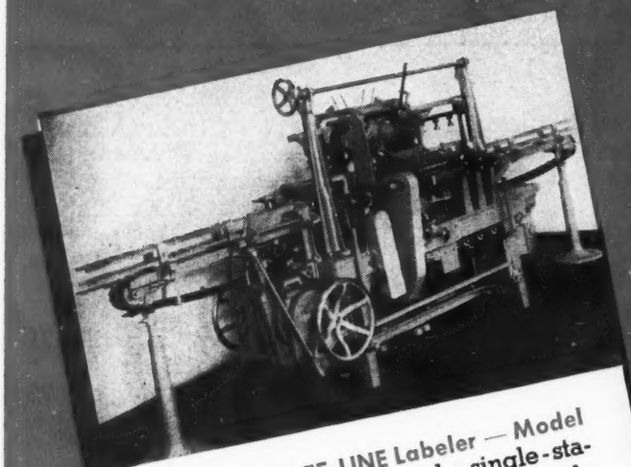
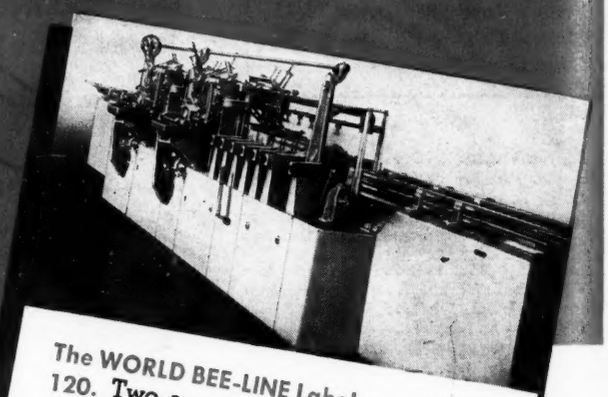
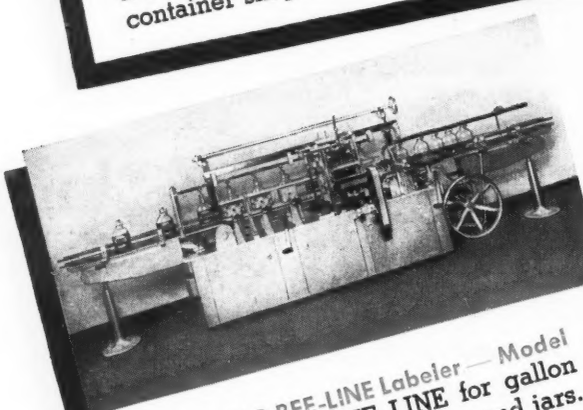


The WORLD BEE-LINE Labeler — Model 65. This compact, sturdy single-station BEE-LINE turns out trim, smooth, precisely labeled containers at a rate of one a second. It applies front labels, front and back labels, and neck labels if desired. It handles a wide range of container shapes and sizes.



The WORLD BEE-LINE Labeler — Model 120. Two-a-second production at the same efficient labeling speed as the Model 65 is effected by this twin station Labeler. BEE-LINES are ideal for the modern lightweight glass and for round, square, flat, oval or panel containers. They go gently but firmly along the BEE-LINE without traffic jams, detours or collisions.



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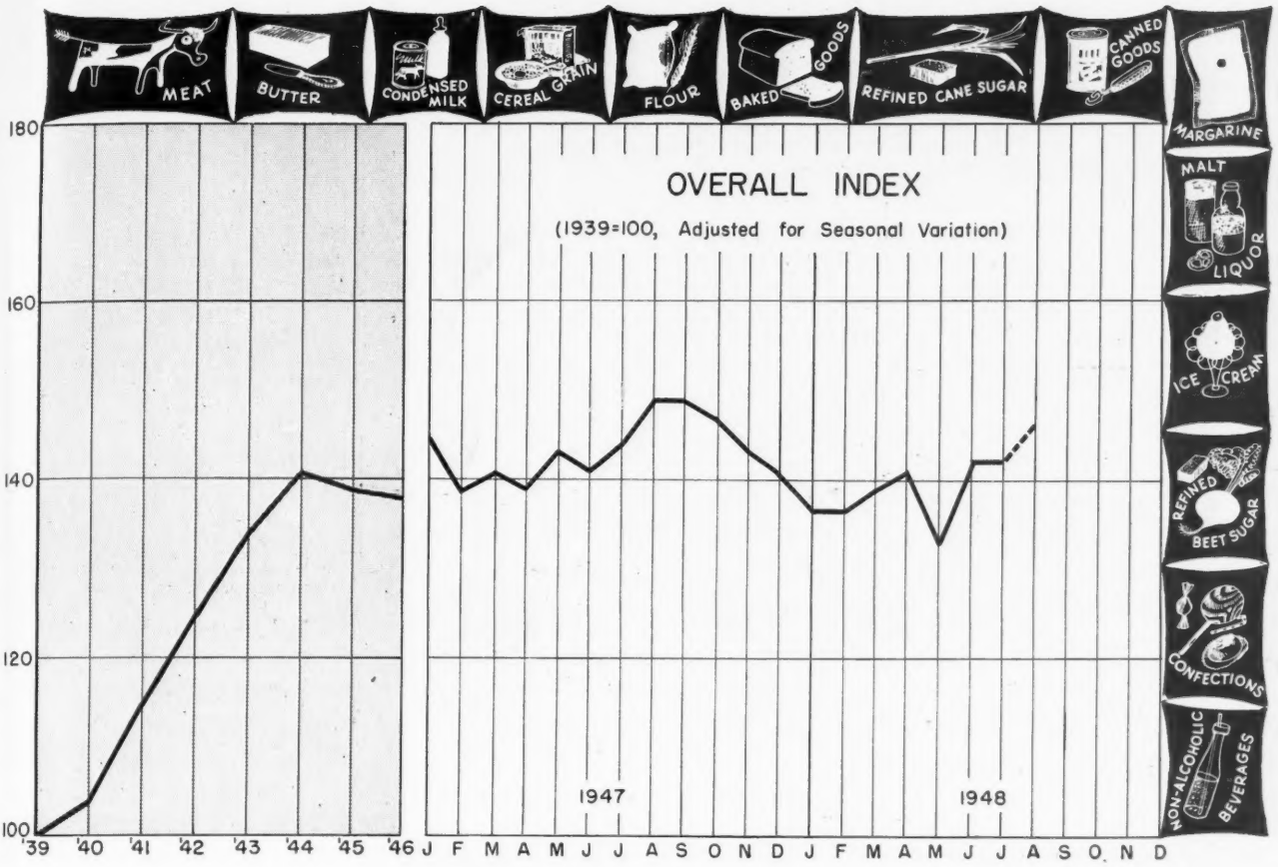


Food Industries Index

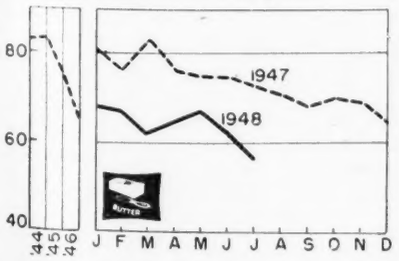
Overall index rises . . . Butter and ice cream output compared with prewar . . . Cane sugar, confections, beverages, cereals strong

With a tentative estimate of 146 computed for August, Food Industries' index of processed food production rose to the highest level reached since Oct. 1947, when a figure of 147 was recorded.

The index, based upon man-hours, showed a final figure of 142 for July, 1948. Latest shifts in the output in 14 individual food industries are portrayed by the charts on these pages.

Each month we shall interpret business trends affecting the overall index and comment on one or more individual charts. This month we discuss the long term growth of overall production and the individual curves for butter and ice cream.

Butter Continues Downgrade



Processing Gains Almost 50%

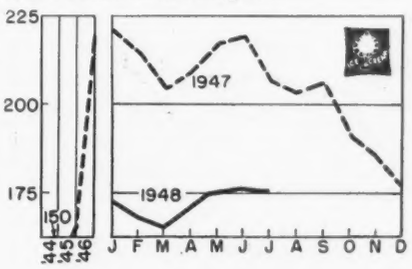
The steady rise in Food Industries' overall index of processed food production reflects a year-to-year rise in American standards of nutrition. The farmer and the food processor combined in 1947 to turn out 12 percent more finished food per consumer than prewar, even though population has also risen about 10 percent.

In the years since 1939, manufactured food production, as shown by the index, has gained almost 50 percent. The reasons behind this are: (1) Population growth, (2) increased per capita food consumption, (3) shifts to processed foods for convenience or lower cost, and (4) higher exports (principally government financed).

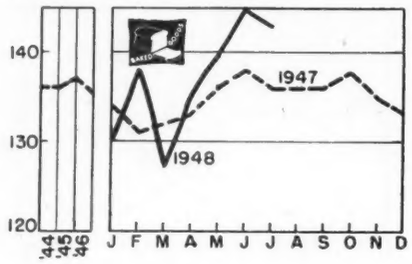
An estimated 13 million population growth since 1939 has certainly helped to boost production figures. But a more remarkable influence has been the gain in per capita consumption. In the prewar years 1933 through 1938, per capita consumption did not rise at all. By contrast, it jumped 12 percent from 1939 to 1946 and is continuing high.

Exports have taken a relatively small part of processed food production. But the spectacular rise in these shipments over prewar totals is interesting. In 1947, the quantity of meat shipped abroad, while small, was one and one-half times as great as 1939. Exports of flour reached a third of production in some months of 1947-48. In 1947 they were over two and one-half times the 1939 total. Dairy products are still not substantial, but they have made startling percentage gains.

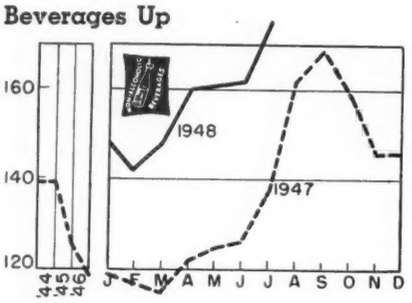
Ice Cream Leveling Off



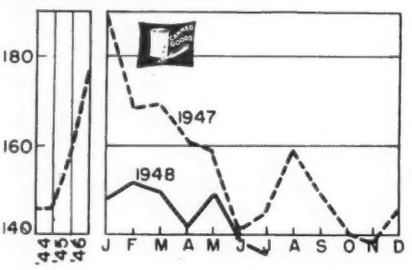
Baking Takes a Slight Dip



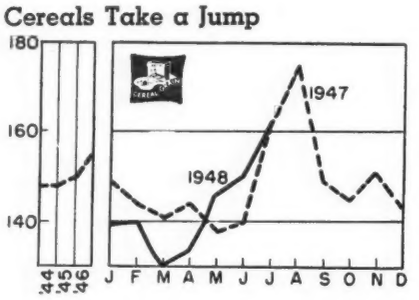
Beverages Up



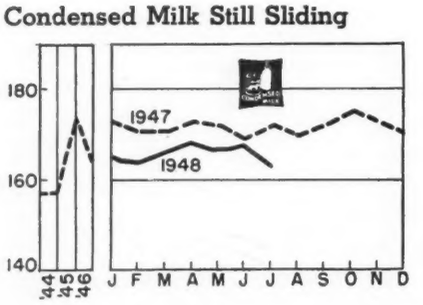
Canning Off 2 Percent



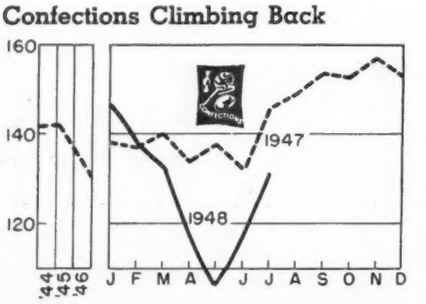
Cereals Take a Jump



Condensed Milk Still Sliding



Confections Climbing Back



Condensed milk shipments in 1947 were 45 times the 1939 figure; evaporated milk, 20 times.

With the end of OPA in Nov. 1946, civilian consumption rose rapidly. Food production had to rise even more rapidly, as distributors began rebuilding stocks to normal peacetime levels. Domestic consumption steadied at the new level in 1947. Government-financed exports rose. And inventory building continued, carrying total production to a new high.

In late 1947 and early 1948, short grain crops hampered food processing. Overstocking of many canned and frozen foods also contributed to a slump in activity. Then, this spring, the packing strike carried the index downward.

Butter, Ice Cream to Increase

Production of butter and ice cream has trended downward since early 1947. But an uptrend has begun to materialize in butter and is expected in ice cream. In the coming months, manufacturers will benefit from a better supply of cream.

The short corn crop of 1947 made cattle feed scarce and expensive. Milk production in early 1948 dropped 5 percent below 1947, as farmers sold their cows for beef and fed less to the remaining animals. Demand for fluid milk has been high. Americans have been drinking as many bottles of milk as last year, despite 13 percent higher retail prices. So farmers marketed most of their milk as plain milk. In the first part of 1948, sales of milk in the form of cream for manufacture were less than 20 percent of all milk sold from farms, compared to 40 percent prewar.

Two factors are now making for better cream supplies: (1) The price of cream has stayed close to its 1948 high, and (2) the bumper grain crop of 1948 is lowering cattle feed cost.

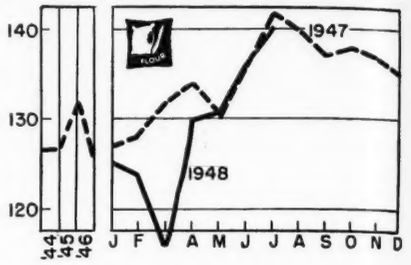
Total butter production for the year may be only 12 percent below 1947. Ice cream production should recover from its earlier slump to within 10 percent of the 1947 total.

The 30 percent drop in margarine is not highly significant, since monthly production has varied widely.

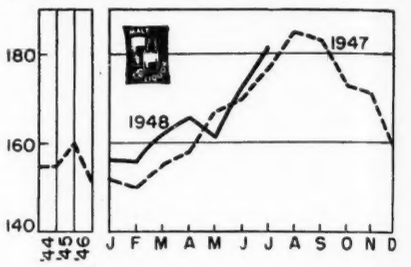
At a Glance—

	July 1948	Month Ago	% Change	Year Ago
Total Index	**142**	**142**	**0**	**144**
Baking	142	145	−2	136
Beverages	175	162	+8	137
Butter	56	62	−10	73
Canning	136	139	−2	145
Cereals	162	150	+8	161
Condensed Milk	163	168	−3	172
Confectionery	131	117	+12	146
Flour	140	136	+3	142
Ice Cream	176	177	0	207
Malt Liquors	182	172	+6	177
Margarine	240	344	−30	225
Meat Packing	150	151	0	151
Sugar, Beet	111	105	+6	118
Sugar, Cane	90	75	+20	108

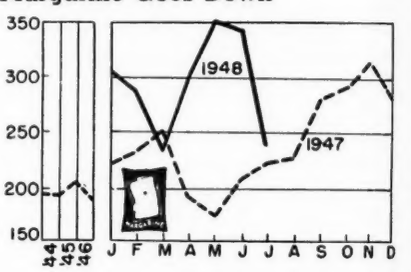
Flour Up Another 2 Percent



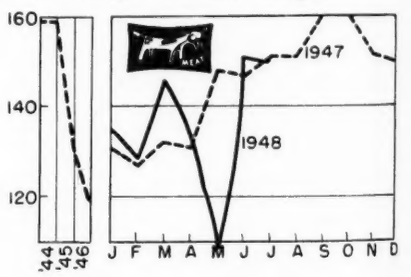
Malt Drinks Keep Climbing



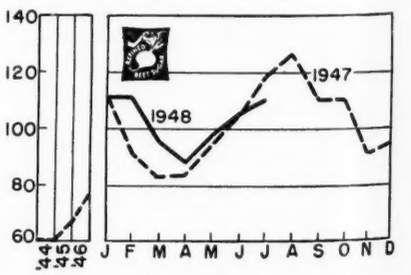
Margarine Goes Down



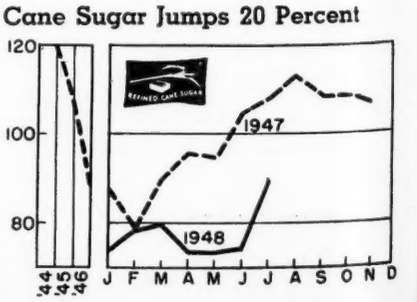
No Change in Meat Output



Beet Sugar Shows Gain



Cane Sugar Jumps 20 Percent



FOOD INDUSTRIES

OCTOBER, 1948

Long and Short of Bumper Crops

FARMERS again have produced a bumper crop. Total agricultural output this year is expected to top that of any other year by about 6 percent. Bumper crops, it seems, are becoming a habit in the United States. This fact adds unusual long-range significance to the short-range implications of 1948 agricultural production.

Short-Range Effects

Corn takes the spotlight in this year's crop report. The estimated yield is 3½ billion bushels. This is 46 percent larger than the short 1947 crop and 18 percent more than average. This huge feed corn supply will have an important effect on trends in the food processing industry.

Backing up corn production will be the second largest wheat crop on record and big yields of other grains. The happy agricultural outlook also includes *record crops* of soy beans, rice, peanuts and pecans; *near record crops* of oats, flaxseed, grain sorghums, dry beans and citrus fruits; and *above average volumes* for all other crops except rye, buckwheat, dried peas, sweet potatoes, apples and pears.

Aside from the fact that Americans will eat well and at lower prices next year, this picture of abundance has another short-range implication. It means a transition from a shortage to a surplus of feed grains.

The number of grain-consuming animals is below prewar levels. So after allowing for the low level of grain reserves and for a fairly heavy export next season, the supply of feed grains per animal unit will be much the largest on record.

The supply of grains will be so huge, in fact, that there has been doubt as to the adequacy of storage facilities. If storage space is short, grain prices for a time may even break through the price floors established by the parity system.

This surplus grain situation means, of course, that cereal processors will pay lower prices for raw materials. But its biggest effect will be to increase the production of meat and other animal products, which spells more competition for other types of food.

Heavy movement of cattle into feed lots this fall is anticipated, and by next summer there should be a larger supply of the better grades of beef. But the expected expansion in the number of pigs produced this fall will bring about the first really significant increase in meat production. Therefore, the first appreciable cut in prices will come next spring and summer. Then if the spring pig crop is large, as is anticipated because of lower corn prices, the meat situation will be eased further in the fall of 1949.

Increased broiler chicken production will bring the first improvement in meat supplies. But this will not be as big a factor as the heavier marketing weights of hogs and cattle to be expected from this winter's slaughter.

A big supply of feed at reasonable prices also will increase the production of dairy products and eggs. But there is some doubt as to whether the dairy increase will be sufficient to meet the demand. We say this because the liquidation of dairy cattle has been greater than that of beef animals. This reflects the growing costs and labor problems in the arduous seven-day-a-week dairy industry.

Long-Range Significance

Because 1948 is but one of a long series of record or near-record crop years, it begins to look as though overall food supplies in this country may be approaching a long-range surplus situation. The revolution in agriculture, discussed on page 74 of this issue by Secretary of Agriculture Brannan, seems to be pushing ahead of the increase in population. In addition the demand for our foods abroad is lessening as world crops improve and as the nations use their scarce dollars to buy machines to improve their industries.

The grain surplus in 1949 will be great—perhaps so great as to cause the political administration in power a lot of first-class headaches. If 1949 should be another bumper crop year, the surplus problem may become critical. But food processors will find it a most welcome change to be able to buy raw materials at reasonable prices.

F K Lawler

EXECUTIVE EDITOR

The Talk of the Industry

• THE Greeks don't have a word for "extension." So guess what they labeled M. L. Wilson, director of Agriculture's Extension Service, who went to Greece in connection with the foreign aid program. They named him the director of the Agricultural Stretching Service. Not a bad title at that.

• MAYBE the frozen foods industry took it on the chin in 1947, but it is fighting hard in 1948. It has even gone into the foundry business to solve one of its problems—a serious shortage of steel castings, which impeded the manufacture of needed cabinets, refrigerators, lockers and other industry equipment. Frozen Foods Institute, Inc., recently purchased Sterling Steel Foundry Co., Braddock, Pa., will spend a cool $2,000,000 to expand and modernize it, and will operate it on a nonprofit basis. Future orders for castings will be taken only from associate industrial members of the Institute.

You just can't keep a good industry down.

• CUBA spent more than $200,000,000 to import U. S. products in the first five months of 1948. This literally is a sweet bit of international trade, since a large part of the necessary dollars came from the sale of sugar to the U. S.

Last year, the value of agricultural products exported to Cuba was ten times greater than in an average prewar year. This year the volume is less because of ECA shipments to Europe.

In the coming years, the amount of Cuban imports—including processed foods—will depend largely on the price and quantity of the sugar Cuba sells in the American market.

If food processors feel they pay too much for sugar, they can get some of their money back by exporting their products to Cuba.

• BRITISH food manufacturers are showing increasing interest in overseas expansion, with preference for establishment in the Commonwealth countries. South Africa is currently a field in which British food processing know-how has found a useful and ready acceptance. Evidence of this is contained in numerous references in company reports, and in the comings and goings of food industry executives to the Union.

It has been historical practice for the British to obtain raw materials from the colonies, process them in Brtain, and sell to the world. But perishable foods are different. You process them on the spot, or else. While some of the foods produced will be used to feed the English and the Commonwealth, much undoubtedly will go into world trade to compete with exports from this country. Or, worse, they may come into our own domestic market. Anyway, it's nice to see an increase in the world's supply of processed foods.

• PRESIDENT Truman has been called to task by National Canners Assn. for giving the impression that all food prices are too high. Prices of canned fruits and vegetables declined throughout 1947. In mid-summer of 1948 they were 17 percent lower than 18 months earlier.

Of course, the President was right in his contention that food prices are too high, and the canners may be splitting hairs in challenging him. But any industry which has lowered its prices is entitled to crow a bit.

Incidentally, more families bought canned vegetables during the first five months of this year than in the corresponding period of 1947. Moreover, the quantities purchased were 9 to 20 percent greater. Sales of canned fruits also increased.

• FOOD markets continue to shift, both between and within regional areas. A McGraw-Hill survey shows industry—and the food-buying power of plant payrolls—gaining in the Midwest, Far West and South, losing in New England. And there is a trend toward locating factories in smaller cities and towns.

Municipalities of ten thousand to one hundred thousand population are the most popular places for plants established between 1940 and '47, according to a survey by National Industrial Conference Board. Only one-third of the plants built or acquired since 1940 by the companies surveyed are in the cities of 100,000 and over. Previously, half of the plants established were in cities of that size. The big town's loss is the little town's gain. Nearly 30 percent of the factories established since 1940 are in places with 10,000 people or less. The figure before 1940 was 20 percent.

As this trend continues—and it almost certainly will—the smaller, local food processing plants will gain well-paid customers more rapidly than the large plants serving big metropolitan centers.

Hors d'Oeuvres

• This is National Donut Month . . . October 18 to 23 is National Cranberry Week . . . and Latin American coffee producers are taxing themselves 10¢ per 132 lb. bag for a $2,000,000 campaign to "encourage Americans to drink more coffee." There is no time for shilly-shally, folks; we must consume.

• *The serving of jams, jellies and preserves at the family table increases bread consumption by 17 percent, according to Van Pinkerton, of the Preserve Industry Council. Probably gives soap and water consumption a lift, too.*

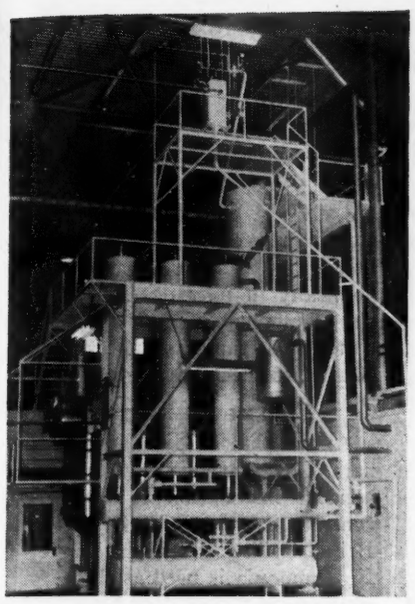
• A publicity piece tells us to: "Imagine, if you can, a package like this. When ready for shipment it is 3,000 cu. ft. . . . And now hold on to your hat. When it reaches its destination . . . it swells to 200,000 cu.ft." After a while you find out it's a polymerized ethylene film balloon and, of course, you can let go of your hat.

• *National Fisheries Institute is quite pleased with that part of the Democratic platform which says: "We favor provisions under which our fishery resources and industry will be afforded the benefits that will result from more scientific research and exploration." It must also please all Democrats to see that their party has the courage to take such a firm stand.*

• H. J. Heinz Co. may be going along with most food manufacturers in junking the old time secrecy policy (which usually locked out better information than it held in). But don't be too sure. They supply hostesses to escort visitors through the plant. And a careful study of a group photograph of the gals suggests that distraction of visitors from food processing might still be getting serious consideration from company officials.

• *Still another publicity man says: "You know and I know that many women are overweight." He then proceeds at length to outline corrective measures. We don't know how he found out that we knew, but if he assumes that we have any objection to this situation, he is taking a helluva lot for granted.*

• Research workers at Garden City, Kan., says *Farm Journal*, have discovered that "baking soda is just the thing for lambs that make pigs of themselves." Trouble is, what we need is more pigs, not a deflated lamb supply. J.A.J.J.



Requires No Steam Nor Other Source of Heat

- Operates at any Temperature Down to 40 deg. F.
- Gives Multiple Effect Economy at Single Temperature
- Delivers all Water Vapor as Condensate

Revolutionary Evaporator Raises Quality and Lowers Costs

New low temperature unit proved successful for citrus—and seen equally suitable for other juices, milk, eggs, pectin and sucrose solutions—it operates with economy of 15 stage steam-boiler multiple-effect evaporator

By JOSEPH A. CROSS, Mojonnier Bros. Co., Chicago, and ARTHUR V. GEMMILL, Assistant Editor, "Food Industries"

ADVANCED FOOD PLANT ENGINEERING

5th of a Series

CONCENTRATION of orange juice at a temperature so low that its flavor is unchanged, yet with operating economies not heretofore attained by commercial evaporation processes, is being performed at Lake Wales, Fla., in a new type of recompression evaporation system.

Results of more than six months operation of this plant indicate that the principle can be applied to the concentration of a wide variety of food products—other fruit and vegetable juices, milk, liquid eggs, pectin, vitamin extracts and sucrose solutions.

The equipment was designed by Mojonnier Bros. Co., Chicago, Ill.*

This new system retains the fuel and water economies of systems using water vapor compressors, yet does so in a simpler manner. Instead of compressing water vapor directly—the method usually employed in recompression systems—the heat latent in this vapor is transferred to a second vapor of lower specific volume. This secondary vapor is raised to the desired heating temperature by compression, and the vapor used for additional evaporation.

EVEN FROM CAPRI

• FOOD INDUSTRIES really started things popping when, in an article last April, it revealed a new evaporation process that was concentrating citrus juices at a temperature below 60 degrees F. with unusual economy.

Since then, inquiries have poured in from all over the world, the Isle of Capri included—"Just how does this amazing new evaporator work?"

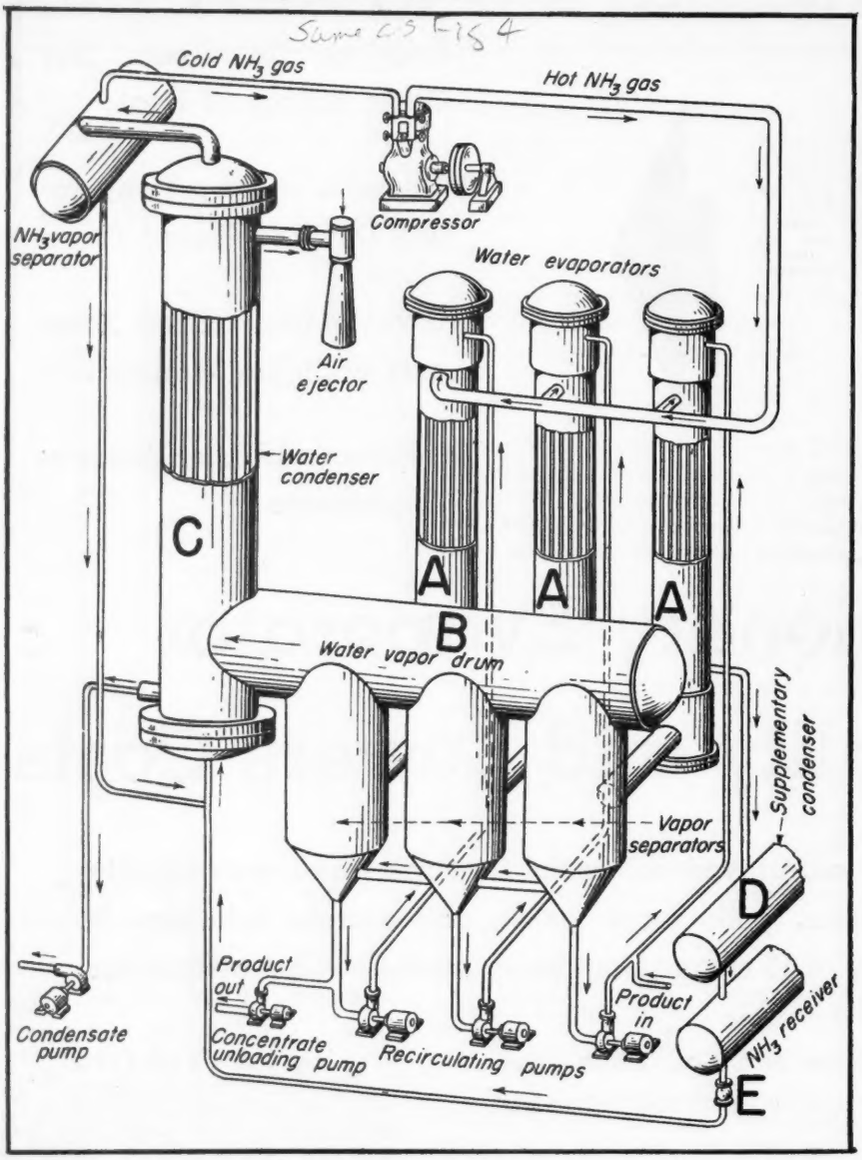
Now, those key details have finally been made available—and are practically presented in this article.—*The Editors.*

Advantages of this indirect recompression system of evaporation are reported by the makers as follows: 1. Multiple effect economy in fuel or power used, at a single evaporation temperature. 2. Evaporation temperatures may be fixed at any desired point from less than 40 deg. F. to above 150 deg. F. by the use of various types of refrigerants in the secondary cycle. 3. No steam nor other source of heat is used—power supplied to compression apparatus is sole source of energy. Small amounts of water may be required to remove heat of compression, although this is not necessary in many cases. 4. Condensate is fully recovered, making this system available for distillation and ester recovery processes as well as evaporation problems.

When water is evaporated, the heat which is latent in the vapor is equal to

* This process and equipment is protected by claims allowed and pending in U. S. and Foreign Patent Offices.

How the New Evaporator Works



HEAT, latent in the compressed NH_3 vapor, causes orange juice to boil in shell and tube condensers (A). Water vapor from (A) is separated in drum (B), and passes into large shell and tube condenser (C). NH_3 liquefied by exchange of latent heat in (A), is further cooled in condenser (D) and passes through expansion valve (E) where it is vaporized in condensing the water vapor. NH_3 vapor returns to compressor completing the cycle.

the heat used in the evaporator, but the temperature is a few degrees lower. The temperature of this vapor can be raised by mechanical compression, and the latent heat reused for additional evaporation. With a frictionless compressor, the energy input of such a system would be only a small part of the energy required to produce steam for a steam-boiler multiple-effect evaporator handling an equal amount of evaporation.

Many such systems have been devised. But their economic usefulness has been restricted by the high specific volume of water vapor at usual evaporation temperatures. Large, expensive, inefficient compressors are required to handle moderate evaporation loads.

Savings in primary steam consumption are usually more than offset by the inefficiency of the equipment, and by maintenance and carrying charges upon the expensive installations.

The Answer

The transfer of heat from water vapor to a secondary vapor effects an enormous reduction in volume. When water is evaporated at 60 deg. F., its vapor has a volume of 1,208 cu. ft. per lb., and contains 1,058 Btu. of latent heat. If this vapor is condensed by the transfer of its heat to boiling anhydrous ammonia at 45 deg., the net result will be 1-lb. of water at 60 deg. F., and 2-lb. of NH_3 vapor at 45 deg. The total volume of NH_3 will be 7.2 cu. ft., with latent heat of 1,058 Btu. By accepting a loss of 15 deg. in specific temperature, the volume of vapor to be compressed has been reduced from 1,208 (the volume of water vapor) to 7.2 cu. ft.

It is obviously unsound to compress 1,208 cu. ft. of water vapor in order to salvage 1,058 Btu. of heat. But the compression of 7.2 cu. ft. of NH_3 with a rise in temperature from 45 to 103 deg. F. to salvage 1,058 Btu. is practical, even in large-scale operations. It can be carried out economically in fully developed commercial equipment of moderate size and cost, with the expenditure of only 60 Btu. of mechanical energy.

Commercial Operation

At the plant of Florida Citrus Canners Cooperative, the pioneer commercial installation is used to concentrate orange juice from 11 to 55 Brix. Boiling takes place at 58 deg. F. Ammonia is used as the secondary medium, with 103 deg. high side temperature, 58 deg. evaporation temperature, and 41 deg. low side temperature. Water is evaporated from the orange juice at a rate of more than 4,000 lb. per hr.

Three stages of forced falling film evaporation are used, with pump recirculation in each stage. The three exchangers are of the shell and tube type, with the orange juice boiling inside the tubes and NH_3 condensing within the shell outside the tubes. Water vapor is separated from the concentrated orange juice at the base of these exchangers, and is conducted to a fourth shell and tube exchanger. In this exchanger, the water vapor is condensed on the outside of the tubes by the boiling of liquid ammonia at 41 deg. F. within the tubes.

Operation of this system is illustrated in the accompanying diagram. Orange juice enters the first evaporator, where it is concentrated to about 17 deg. Brix. The partly concentrated product then overflows to the second evaporator, where additional water is removed, concentrating the juice to approximately 30 deg. Brix. In the third evaporator the concentration is completed. The juice then tests approximately 55 deg. Brix. The concentrated product is removed continuously by a variable speed product pump. Concentration is controlled by modulating the flow of juice at the inlet and outlet.

Vapors from the three evaporators are collected in the water vapor conductor pipe, and passed to the shell of the fourth exchanger. The liquid NH_3 that was condensed in the evaporators is first passed through a supplemental condenser to remove surplus heat; then through an expansion valve to reduce its temperature by flashing, and finally flooded inside the vertical tubes of the refrigerated shell and tube exchanger. By a mutual exchange of

latent heat, the liquid NH_3 is vaporized at 41 deg. F., and the water vapor is condensed at 58 deg. F.

The NH_3 vapor passes to a 4 cylinder, 11 x 10 Frick compressor, where the temperature is raised from 41 deg. to 103 deg. (condensing temperature) and discharged to the three water-evaporator, ammonia-condensers.

Heat Balance

In the system, stabilized at the above temperatures, the calculated heat balance is:

Capacity of 11 x 10 4-cylinder VSA ammonia compressor, operated at 300 rpm. at approximately 91 percent volumetric efficiency, compressing NH_3 vapor from 41 deg. F. at 60 lb gage pressure to 103 deg. at 205 lb. gage, is 9,215 lb. NH_3 per hr. Converting this capacity to Btu.:

9,215×623.2	=5,742,788 Btu.
in NH_3 vapor at 41 deg. F.	
	+ 607,268 Btu.
added by compressor.	
	=6,350,056 Btu.
in vapor leaving compressor.	
	—4,286,818 Btu.
required to boil off 4,047 lb. water from the orange juice.	
	=2,063,238 Btu.
remaining in NH_3 leaving evaporator.	
	— 607,268 Btu.
transferred to water in supplementary condenser.	
	=1,455,970 Btu.
in liquid NH_3	
	+4,286,818 Btu.
transeferred from water vapor to NH_3 in 4th condenser.	
	=5,742,788 Btu.
in NH_3 vapor to compressor.	

Line pressure drop and radiation losses are disregarded in the above calculations. These losses are of small magnitude, as is shown by data compiled during a one-hour operating period on a typical day at Lake Wales:

High side NH_3 condensing temperature.....103 deg. F.
High side NH_3 pressure.....205 psi. gage.
Evaporation temperature of orange juice.....58 deg. F.
Low side NH_3 evaporation temperature .....41 deg. F.
Absolute pressure at ejector.....34 in. Hg.
Power used by compressor.....198 kw.
Water used (in at 80 deg., out 96 deg. F.).....75 gpm.
Weight of condensate.....4,050 lb.
Entrainment (sugar in condensate)....none
Brix. of orange juice entering....11 deg.
Brix. of juice, 1st stage.....17 deg.
Brix. of juice, 2nd stage.....30 deg.
Brix. of juice, 3d stage.....55 deg.

The evaporation temperature of 58 deg. F., with heating temperature never exceeding 103 deg., was used at Lake Wales because of the extreme heat sensitive nature of orange juice. The economical use of the system, however, is not limited to low temperature applications.

By the proper selection, from a wide range of available refrigerants and different types of compression equipment, any required evaporation temperature within the range of 40 to 160 deg. F. or higher may be obtained. In concentrating fluids less sensitive than orange juice, greatly increased economy of fuel or power may be obtained with these higher heating and evaporation temperatures.

Transfer Surfaces Important

Amount of power or fuel used in this system is in inverse proportion to the areas of transfer surfaces used in the exchangers. Doubling these areas will about halve the power used at the compressor. When heat transfer coefficients are accurately known, determination of optimum amounts of surface is a matter of balancing the increased cost of large amounts of exchange surfaces against the lowered cost of compression equipment, and lowered operating costs made possible by increased surface.

Since heat is added to the secondary vapor by compression, the water evaporative capacity of this system is determined by the refrigeration effect (rather than the heating effect) of the NH_3 vapor recirculated. The accompanying table shows the refrigeration effect produced by a 10x10 4-cylinder compressor, operated at 360 rpm., under various suction and discharge pressures, and the b. hp. needed under each condition.

Water evaporative capacity may be determined by dividing the refrigeration effect by the latent heat of water vapor at the condensing temperature used. This table illustrates the wide range of evaporative capacities and variations in power consumption when different areas of transfer surfaces are used in the evaporator.

For example, if limited amounts of surfaces are used, and a system reaches equilibrium at 25 deg. suction temperature and 123 deg. discharge temperature, then the compressor will require 341 hp. for 3,160,000 Btu. of refrigeration effect, and evaporative capacity will be about 3,000 lb. per hr. When excessive areas of transfer surfaces are used, and stability is reached at 100 deg. suction, 123 deg. discharge, then 231 b. hp. will produce 12,234,000 Btu. of refrigeration effect, and about 12,000 lb. of evaporation will be obtained.

When sufficient exchange surface is used to yield 12,000 lb. of evaporation per 231 b. hp. or 19.3 hp. per 1,000 lb. of evaporation, this system could be operated by 8 lb. of fuel oil, burned in a Diesel powered compressor, per 1,000 lb. of evaporation. This economy cannot be approached by any practical number of effects in a steam-boiler multiple-effect evaporator system. In such a system, 8 lb. of fuel would produce about 112 lb. of steam. An evaporator with approximately 15 effects would be required to produce 1,000 lb. of evaporation with 112 lb. of steam.

Capacities Vary With NH_3 Suction and Discharge Temperatures

REFRIGERATION EFFECT of a 10 x 10 NH_3 Compressor Operated Under Different Suction and Discharge Temperatures, Based on Subcooling Liquid NH_3 to 100 Deg. F., Compressor Speed of 360 Rpm. and Volumetric Efficiency of 91 Percent.

Suction Temperature Deg. F.	Gage Pressure Psi.	Volume Lb. NH_3 Per Hr.	Refrigeration Effect Btu. Per Hr.	Heat of Compression in Btu. per lb., and Brake Horsepower at Various Discharge Pressures and Temperatures.					
				185 Psi. 96.34° F.	205 Psi. 102.42° F.	225 Psi. 108.09° F.	245 Psi. 113.42° F.	265 Psi. 118.45° F.	285 Psi. 123.31° F.
25	39.6	6,812	3,160,000	81.1 251	87.1 268	99.3 289	100.2 304	105.9 326	111.1 341
30	45.0	7,530	3,504,000	73.9 251	80.7 275	86.9 291	92.7 316	98.2 334	103.4 351
35	51.6	8,308	3,875,000	67.2 251	73.8 277	79.9 300	85.6 321	91.1 342	96.1 361
40	58.6	9,147	4,291,000	60.6 250	67.0 276	73.0 301	78.6 325	83.9 347	88.8 368
45	66.3	10,054	4,714,000	54.2 246	60.6 275	66.4 302	72.0 327	77.2 350	82.1 374
50	74.5	11,030	5,184,000	48.1 240	59.3 271	60.1 300	65.6 326	70.7 353	75.5 376
55	83.4	12,079	5,696,000	42.1 230	48.2 262	53.9 295	59.3 323	64.4 352	69.1 376
60	92.9	13,208	6,235,000	36.4 217	42.5 253	47.9 286	53.3 319	58.2 347	62.8 374
65	103.1	14,417	6,819,000	30.8 201	36.8 239	42.2 275	47.5 310	52.3 342	56.8 371
70	114.1	15,715	7,458,000	25.2 179	31.3 223	37.8 260	41.8 297	46.6 321	51.1 363
75	125.8	17,098	8,116,000	20.2 156	26.1 201	31.3 241	36.3 281	41.1 318	45.5 351
80	138.3	18,586	8,838,000	....	20.9 175	26.0 217	31.0 261	35.7 300	40.1 337
85	151.7	20,168	9,605,000	....	....	21.7 198	25.9 236	30.4 277	34.8 313
90	165.9	21,874	10,430,000	....	....	....	21.0 207	25.5 251	29.7 294
95	181.1	23,683	11,306,000	....	....	....	....	20.6 221	24.8 265
100	197.2	25,605	12,234,000	....	....	....	....	....	20.0 231

Secretary Looks Forward to . . .

Agriculture's New Day

With the raw materials production curve due for a further rise, new markets abroad may have to be found for the growing surplus from the American farm

By CHARLES F. BRANNAN
Secretary of Agriculture

THE productivity of American agriculture is set in a rising trajectory that will carry farm production upward for the next quarter century. This is the outlook for farming in the United States. Only the drag of adverse economic conditions at home and in the world can change the outcome.

Leads World

The United States is today the preeminent agricultural producer of the world. Our outstanding industrial development so overshadows our agricultural position that we often fail to recognize that we are the world's No. 1 farm country. The world now uses around two billion acres of cropland for its farm production, but the United States, with about 6 percent of the world's population, contains about 20 percent of the cropland.

This ratio of population to cropland is extremely favorable, but even it falls short of revealing the true dimensions of our productivity. The almost universally high yields of our crops this year are a perfect illustration, and the Crop Reporting Board of the Department of Agriculture singled it out for special comment in a recent report. Our yields per acre are so good this year that they are, in fact, 134 percent of the average in the pre-drought span of 1923-32 and 8 percent better than the previous best mark, set in 1942. The board credited beneficent weather, of course, with helping to lift yields but went on, nevertheless, to point out various man-made influences that favored high production. These included "timeliness of all operations this season, excellent state of preparation and cultivation of fields, and light harvesting losses with modern machinery, the use of more fertilizers, insecticides and weed-killing chemicals, and the constant improvement and adoption of new disease-resistant, higher-yielding varieties." Not only are these indeed man-made, but, by and large, they can wear the label "Made-in-the-United-States."

Secretary Brannan's survey was written especially for FOOD INDUSTRIES readers at the request of the editors. It is particularly significant for processors in view of the unprecedented yields of raw materials now in hand or in sight for the current crop season.—*The Editors*

Agricultural Revolution

In them can be found, moreover, the pattern of the agricultural revolution that burst forth under the pressure for production to feed our war effort at home and abroad. The revolution, created by machine power, fertilizers,

insecticides, herbicides, and the new varieties, has been in the making for a full century, but the more explosive ingredients were compounded only within the past thirty years. A simple comparison throws a spotlight on the magnitude of the revolution: The average farm worker in the United States in 1820 produced enough to support himself and only a little more than three others, by 1920 enough for himself and nine others, and by 1945 enough for himself and more than 13 others.

This tide of productivity has only set in within a generation, and it could continue to flow toward a highwater mark that cannot now be readily discerned. Certainly the years ahead should bring even greater advances unless the tide is slowed, halted, or even turned back. This cannot happen, however, if we maintain high employment at home and at the same time find new markets abroad for sizeable quantities of those products which even now are edging toward a surplus. Any list of them should certainly include wheat, cotton, rice, dried fruit, citrus fruit, apples, and naval stores. Lard and dairy products could easily move into the same group. The assurance farmers need to continue the upsurge is the knowledge that markets await their output. Employment and exports are the best of all guarantees of the necessary markets and the confidence they inspire.

Land Plus Machine Power

With the incentive of prosperous marketing, farmers are more than likely to keep their output moving upward in pace with our population, which will certainly exceed 160,000,000 and could reach 185,000,000 by 1975. In fact, production could easily out-pace population and bring forth an acute need for exports. Improvements identical in pattern with those embodying the agricultural revolution of the second world war will yield the increased production of the next quarter of a century.

Cropland used in producing food will continue to expand by the replacement of horses and mules with machines. Mechanization already has released 55 million acres, and 25- to 40,000,000 more will be converted to food production by 1975.

The total cropland, however, can be expected to remain about at its present area of 420,000,000 acres. Irrigation, drainage, and clearing may add 12,000,000 acres in the next decade or so, but these gains must be weighed against the necessary retirement to grass and forest of land where erosion is a menace and fertility has been depleted. Shifts of this kind usually lift the average yield per acre by devoting better land to crops.

Farm tractors can be expected at least to double in number to reach 5,000,000 by 1975. In addition to freeing more land for food production, this increase in tractors can be expected to release 15 to 20 percent of the farm workers for industrial and service employment.

Many Improvements

Fertilizers, insecticides, and herbicides have become increasingly valuable adjuncts to farming. They assure improved yields per acre, and the first two played a large part in the impressive wartime gains.

Such weed killers as 2,4-D are a postwar innovation in commercial production, and 1948 is the first year in which that chemical has been used on extensive corn and wheat acreages.

Farmers have more than doubled their fertilizer tonnage since 1935-39 and it now exceeds 15,000,000 tons a year. This tonnage can double again in the next 25 years.

Insecticides also are gaining wider use. Increasing emphasis, moreover, will be placed on the protection of harvested crops, especially grains, as long as a high level of prices prevails. Insect losses are estimated at 5 percent of our grain crops in storage. This is the equivalent of the production from 10,000,000 acres.

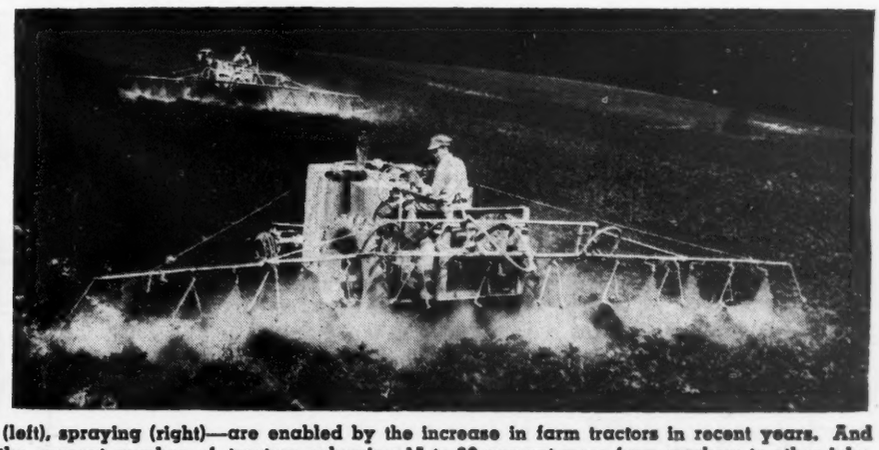
Hybrid corn adds an average of 400,000,000 bu. a year to our corn crop through higher yields. This is the equivalent of about 15,000,000 acres at the yield levels from open-pollinated corn which, incidentally, is still in use on 25 percent of our corn acreage.

It would be reckless to forecast another breeding development as spectacular as hybrid corn. But scientists in colleges and experiment stations are pressing forward, comprehensive research with animals, poultry, grain, sugar cane, and fruits and vegetables. Notable achievements have been recorded and their net values are inextricably contained in the production gains to which they contributed.

Conservation

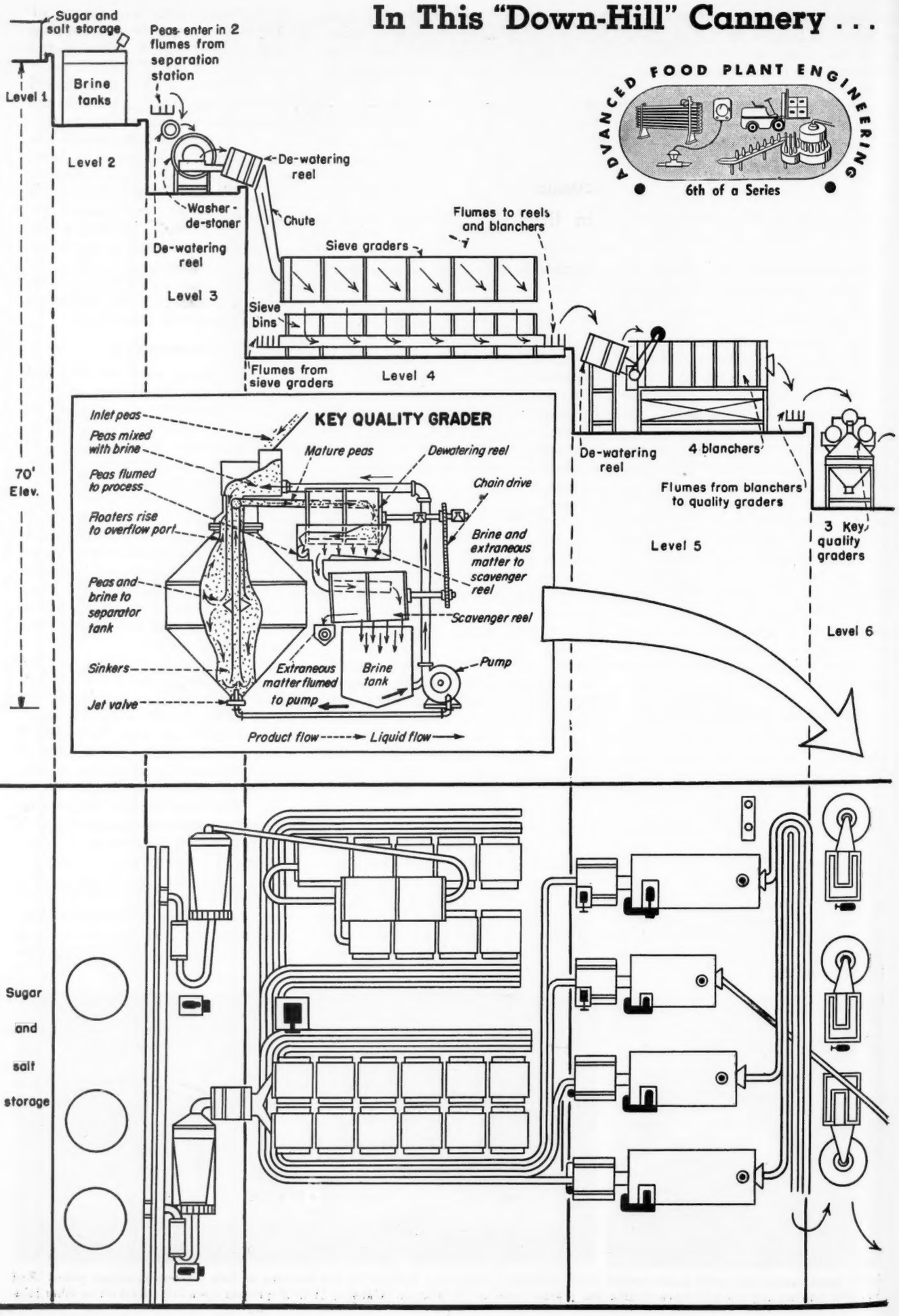
The menace of worn out land and worn out people often leads us to think of soil conservation as primarily an obligation to posterity. Indeed it is. But conservation is also good land management, and the modern conservation practices add to our productivity here and now. Contour farming, strip cropping, use of good rotations, terracing, tree-planting, and pond-building—to mention a few—make more efficient use of our soil and water, our labor and machines. These practices will continue to aid farmers not only in lifting their yields, but also in raising the net worth of their farms.

The agricultural revolution that has swept the United States is the result of the amalgam of an inventive and resourceful people with rich new farmlands. Many influences have shaped the revolution which gained greatest momentum after the depression. Among notable sources of our advancement is to be found our constant reliance on research, an industrial system keyed to supplying agricultural needs, and our system of land ownership in which the family-type farm is predominant. Our primary problem today is to keep our economic structure so strong that these same influences can continue to work for the betterment of American agriculture.



Large scale operations—such as harrowing (left), spraying (right)—are enabled by the increase in farm tractors in recent years. And by 1975 we are expected to have double the present number of tractors, releasing 15 to 20 percent more farm workers to other jobs.

In This "Down-Hill" Cannery . . .



Advanced Design, Gravity Flow Save Labor and Machines

Viner station and processing plant form a compact unit. Podded peas, conveyed and washed in flumes of clean, cold water, retain their quality

By **FRANCIS A. MILLER, Plant Superintendent, Umatilla Canning Co., Milton, Ore.**

WHEN we set out to build and equip our new Umatilla pea cannery, problems were posed which taxed the engineering ability of our entire staff—for the year was 1944, meaning scarce machinery, scarce supplies, and even scarcer labor.

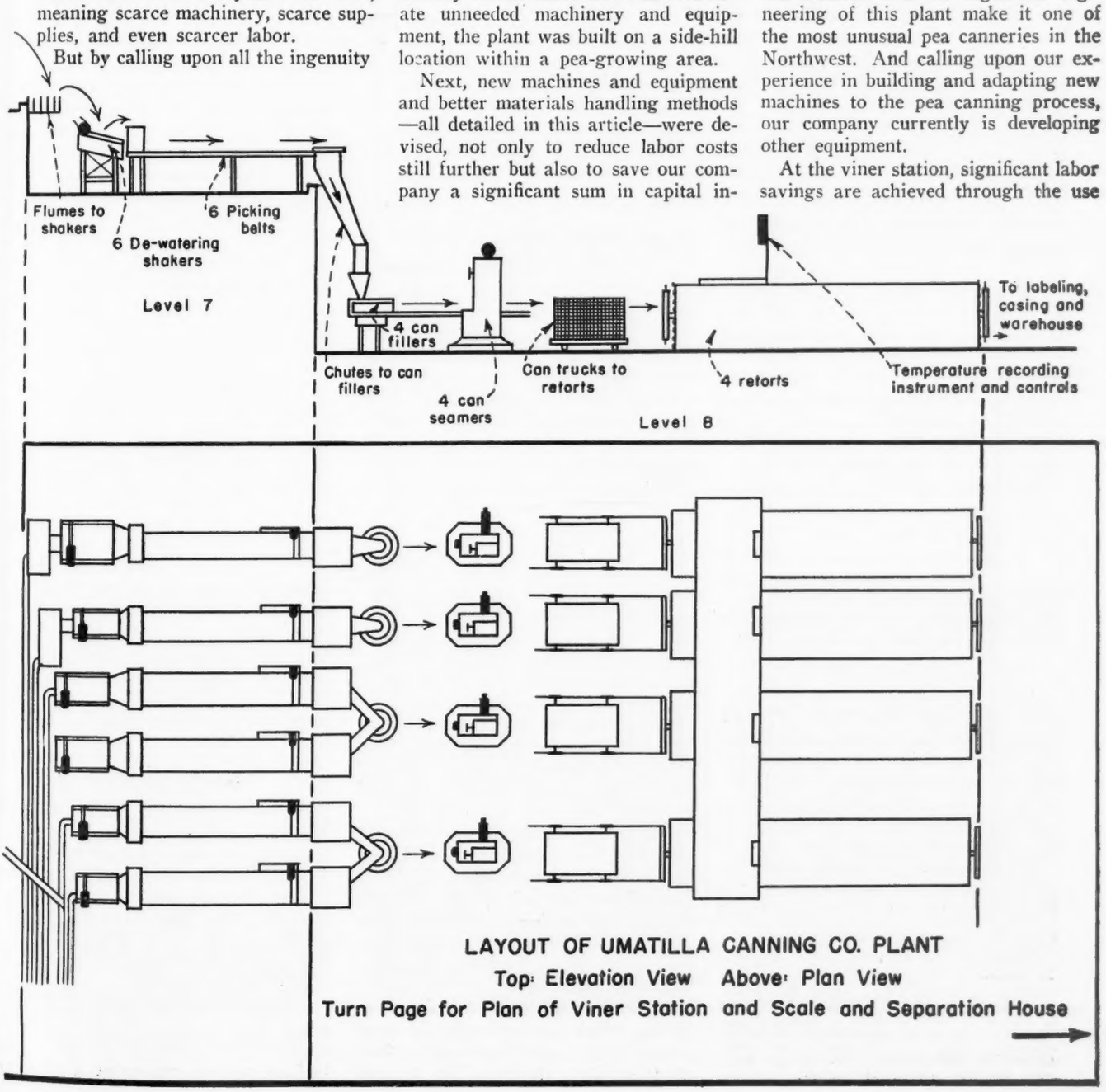
But by calling upon all the ingenuity and inventiveness we could muster, these difficulties were surmounted in a two-way attack on the problems.

First, to achieve gravity-flow and thereby reduce labor costs and eliminate unneeded machinery and equipment, the plant was built on a side-hill location within a pea-growing area.

Next, new machines and equipment and better materials handling methods —all detailed in this article—were devised, not only to reduce labor costs still further but also to save our company a significant sum in capital investment and in the maintenance and depreciation of such equipment.

Operations at Umatilla Canning Co's., Milton-Freewater, Ore., plant are now so successful that our cannery runs at high capacity, requiring minimum attention from the operators. As a matter of fact, the selection of a side-hill location and the ingenious engineering of this plant make it one of the most unusual pea canneries in the Northwest. And calling upon our experience in building and adapting new machines to the pea canning process, our company currently is developing other equipment.

At the viner station, significant labor savings are achieved through the use

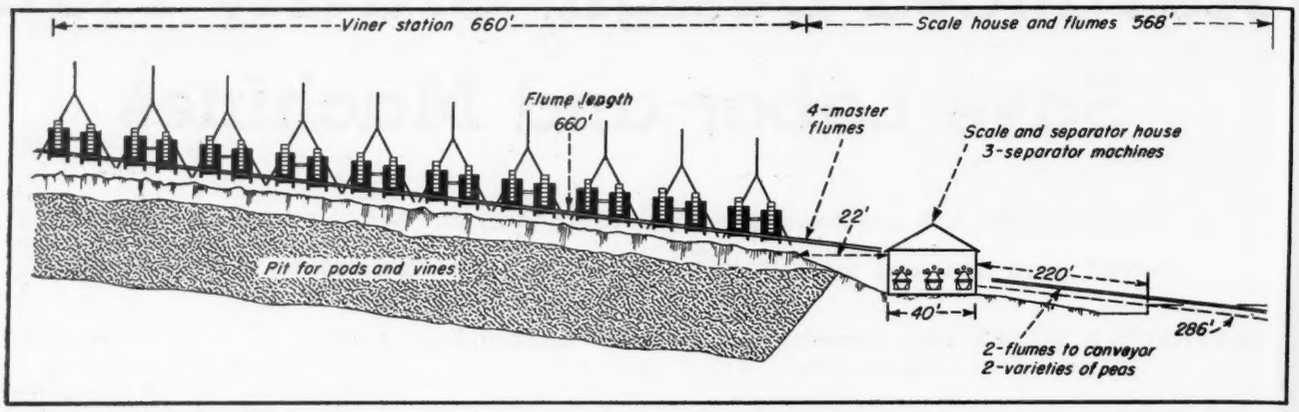


LAYOUT OF UMATILLA CANNING CO. PLANT

Top: Elevation View Above: Plan View

Turn Page for Plan of Viner Station and Scale and Separation House

Coming From Viners, Peas Are Flumed to Scale and Separation House



VINER STATION and separation house cover ¼-mile space. From scale house peas are flumed into plant at Level 3 (see first drawing).

of a mechanized method of handling unthreshed peas to the viner and a fluming system of delivering the podded peas directly into the process without the aid of pumps.

In the plant, further savings are made as a result of the installation of three Key* Froth Flotation Cleaners for separating vined peas from extraneous matter and three Key Quality Graders for grading peas before they are canned.

The total manpower required to keep viner station and plant operating at its capacity of 150 tons of raw peas per 24-hr. day is estimated at 170 persons, whereas a conventional operation of this size would require 280 persons. While in full operation, the plant uses 800 gpm. of water, none of which is recirculated or reused in the plant. With the exception of boiler power, the viners and the entire plant are powered by electricity, using approximately 350 kw. per hour.

Peas are grown within a radius of eight miles of the plant. Harvesting equipment is the most modern: Swathers cut and windrow the unthreshed peas, mechanical loaders elevate them from the windrows onto trucks, and they are delivered to the hilltop viner station in a matter of minutes.

Deterioration Retarded

As the peas are podded by the viners, they fall directly into flumes of fresh running water, which convey them into the process. Immersion in cold water directly following podding retards enzymatic deterioration, which would result from exposure to sun and air at this point of the process.

Within 60 min. from the time the peas are cut and windrowed in the fields, they have been processed and canned.

With the use of mechanical materials-handling equipment, invented and installed by the company, this viner station requires only 10 men to feed unthreshed peas to the 20 viners, 5 viner maintenance men, 1 foreman and 1 tractor driver whose duty it is to spread and compress the discarded vines and pods ensilaged for stock feed. At viner stations using the normal complement of men and without the materials-handling equipment used here, about 50 men would be needed to operate 20 viners at capacity.

New Truck-Unloading Device

Trucks that haul the unthreshed peas to the viners are equipped with an unloading device. This consists of a 24-in. cross-bar and chain conveyor which runs the full length and across the floor of the truck bed.

The conveyor chains run over sprockets on a shaft that has a sheave at the right rear of the truck body. To dump the truckload of peas, a cable wound around this sheave is attached to a post fixed in the ground at a point in front of each viner unit. The truck then moves ahead slowly, under its own power; and as the attached cable pays out it revolves the sheave, actuating the cross-bar conveyor. The conveyor moves the entire load of peas to the end of the truck and dumps it in front of the viner unit. Viner operator and truck driver do this job.

Above the plant on the summit of the hill, which slopes gently toward the separator-scale house, there are 20 viners. They are arranged in units of two, and one viner operator feeds a uniform flow of unthreshed peas to each unit. The significant labor saving accomplished at this viner station is effected through mechanizing the handling of the unthreshed peas—a job usually done by men, one to a viner, feeding the vines into the conveyors with pitchforks.

With the exception of the new viner-hoists, which are hydraulically powered, electric power is used throughout at this viner station. The original viner hoist uses an electric motor and each viner is powered by a 15-hp. 1800-rpm. motor.

The original hoist, still used on nine of the viner units, is powered with a 1000-lb., 30-fpm. electric motor. It is located in the center of a cross-bar connecting each of the two viners that make up a unit. A ¼-in. cable runs from the sheave of this motor-hoist, through a pulley at the top of the 35-ft. stationary boom, and down to the viner operator's station.

The Key 4-Tined Fork, on the end of this cable, has a cross-bar that connects the two sets of double tines. This cross-bar is hinged in its center. Tension, applied at this hinge by the cable when lifting a load, serves to drive the tines deeper into the vines. The fork is released from the load when its cable is relieved of tension, permitting the viner operator to disengage the fork.

To operate the hoist, the right hand operator's grip is turned clockwise to raise a load, counter-clockwise to lower it. The length of the cable extending downward from the 35-ft. boom permits the operator enough latitude of movement to reach his supply of unthreshed peas and, after hoisting them off the pile, to move the fork-load to either viner conveyor in his unit. One viner operator can feed as much as 120,000 lb. of unthreshed peas per 12-hr. shift to his viner unit with the aid of this hoist.

New Viner Hoist

While this original hoist was and still is efficient wherever electric power is available, it cannot be used in fields where such power is not readily and economically obtainable. The new Key Viner Hoist has been adapted to viners using gasoline motive power, and is suitable for use in any packing locality.

The new hydraulic hoist derives its power from a hydraulic pump geared to the viner's feeder-drive axle. The hydraulic pump maintains a uniform

* "Key" is the tradename of the Key Equipment Co., Milton, Ore. The company is headed by Claude L. Key, president of Umatilla Canning Co. As noted, some of the equipment described in this article is patented and manufactured by the company, and it is now being made available to the food industry.

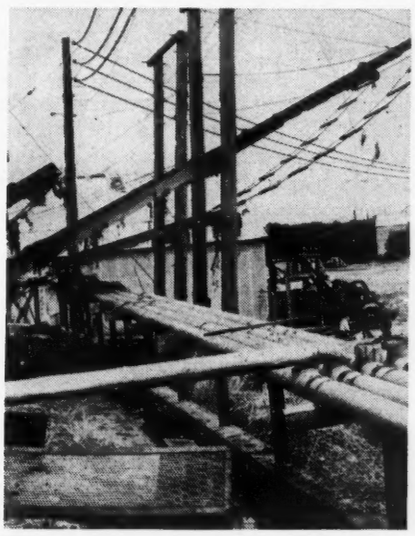
From Pea Viners to Graders, Devices Save Labor

1. VINER station is atop hill. Two viner hoists (left) are old type. Third one behind truck is a new unit.

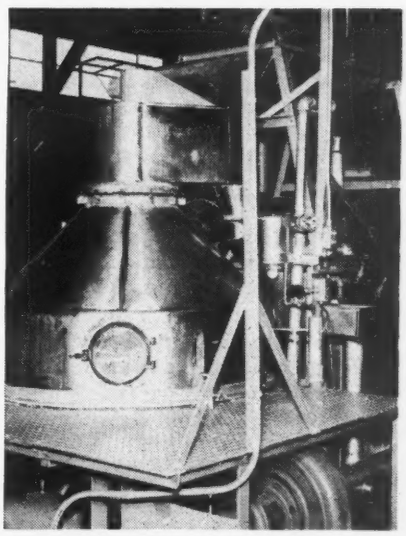
2. OPERATOR lifts load preparatory to moving it to viner-elevator, where he will lower it and release fork.

3. VINER-FEED regulator smooths flow as operator dumps a 500-lb. load of unthreshed peas into viner-elevator.

4. SCALPERS on each viner unit remove foreign material, such as pods and broken vines.

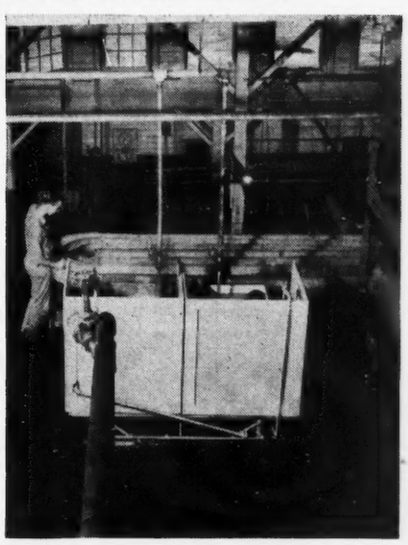


5. FOUR master flumes pass behind 20 viners and carry peas from viner-scalpers to separator scale house.

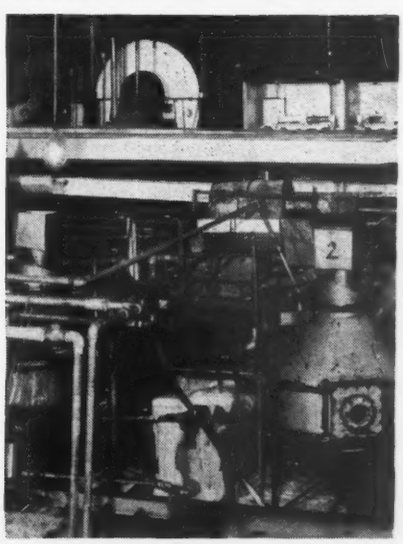


6. FROTH flotation cleaner, located in separator scale house, separates peas from weeds and foreign seeds.

7. SIEVE size-graders on Level 4 separate the peas into four different sizes. Peas drop into one of four flumes.



8. FLUMES are used for routing selected sieve sizes from graders. Brine-density regulators are seen, front.



9. QUALITY GRADER mixes peas with brine. This process separates lighter tender peas from heavier mature ones.

500 psi. in its reservoir. It is equipped with a bypass valve to relieve the reservoir of excessive pressure developed by the pump, which operates continuously from the viner's gasoline or electrically driven feeder-drive axle.

Lifting power of this hoist comes from a piston operating within a cylinder 2¼ in. in dia. by 4 ft. long. This piston is attached to the upright of the swivel boom. The boom is 12 ft. high and is made of 3-in. aluminum tube.

The hoist cable is attached to the end of the piston, and the operator raises or lowers the hoist with a handgrip similar to the one on the original hoist. Turning of the hand grip actuates a solenoid valve which applies or relieves the hydraulic pressure in the cylinder. Power for the solenoid comes from a 6 v. battery. The 12-ft. boom swings with the viner operator's movements, making it easy for him to move about in front of both viners.

While some batteries of viners are stationary, most of them are mobile and temporarily set up in the center of acreages to be harvested. A large percent of these mobile viners are powered by gasoline motors.

Trucks haul unthreshed peas to the viners from areas surrounding the viner stations. After this acreage is harvested, the viners are transferred to another central location where the process is repeated.

By cutting the length of the booms from 35 ft. to 12 ft., it is now an easy matter to move the hoists and hydraulic equipment to other areas. Furthermore, these new hoists simplify handling of fork-loads of unthreshed peas. Fork-loads swivel with the operator's movements when he uses the new viner. But when using the old viner with the 35-ft. boom, he must push fork-loads of unthreshed peas against gravity.

When unthreshed peas are fed manually, with pitchforks, to viners, operators can maintain a more or less uniform flow. But these hoists enable an operator to drop as much as 500 lb. of vines on an elevator. Such amounts would overload a viner if fed directly into the machine and would probably result in mechanical breakdowns.

Viner-Feed Regulator

So a viner feed regulator is provided to control the amount of vines entering the viner from the elevator. It is so adjusted as to permit a flow of vines about 8 in. deep.

The regulator consists of six saw-toothed plates, arranged in two sets of three each. Each set operates on two separate crankshafts attached to the angle-iron framework that suspends this equipment from the viner. Regulators are chain-driven with power derived from feeder-drive axle.

In operation, one set of these saw-toothed plates is always engaged in the oncoming vines, rolling them back against the movement of the finger-link conveyor. Simultaneously, the other set of plates is revolving to take a new position in the vines after the first plates are disengaged from them. This elliptical motion of the saw-toothed plates against the vines tends to smooth the flow into a uniform depth of 8 in. The speed of the finger-link elevator is coordinated, as the regulator controls this uniform flow.

Elevator conveyors, on the rear of the viners, are extended 30 ft. in order that vines and pods can be dropped into the pit silo within easy reach of the bulldozer.

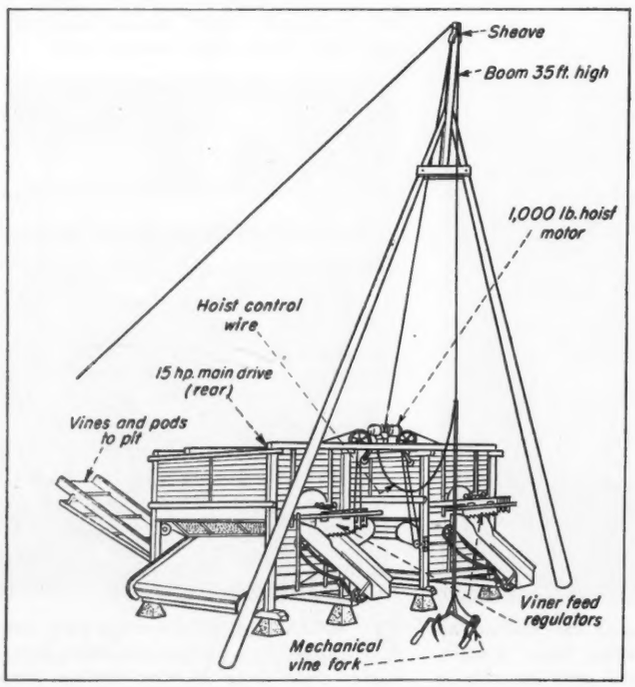
There are four 5-in. dia. galvanized master flume pipes leading from the viners to the separator-scale house. These flumes pass behind all the 20 viners. At their point of origin, behind the farthest viner unit, four ¾-in. standpipes deliver 15 gpm. of clear, cold water into each flume at 60 psi. Pressure is developed from booster pumps. Water comes from city water supply.

Supplanting the conventional lug-box hopper is a galvanized metal flume located on each side of the viners and running the length of the draper. The podded peas drop into this flume and flow to the pod-and-stick scalpers located beside each viner unit. Volume and pressure of water for this purpose are adjusted to coordinate with the amounts of peas to be moved from flume to scalper. A ¾-in. standpipe which enters each flume at the front of the viners provides this water.

Removal of Foreign Matter

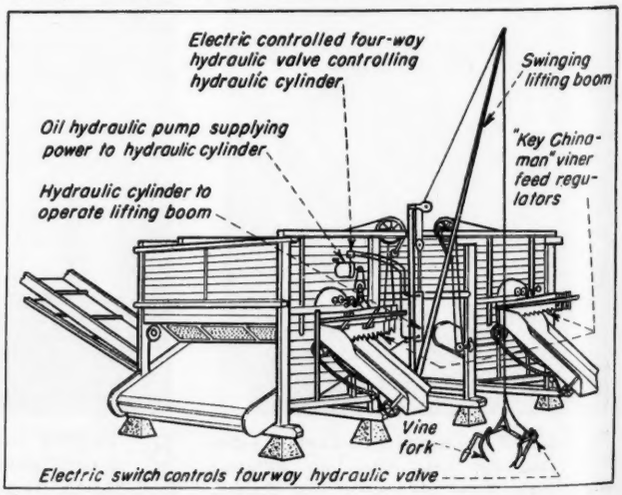
In addition to the washing given the peas in flume water, the scalpers supplant the use of cleaning mills and remove a considerable amount of foreign matter from the peas before fluming them to one of the four master flumes. The scalper unit consists of a perforated plate, 18 in. wide by 5 ft. long, with overhead rubber-edged paddles which move with the flow of peas across the plate. The perforations in these plates are designed to accommodate movement through them of two pea varieties, "Perfection" and "Profusion." For Perfection the perforations are of ½ in. dia., for Profusion 9/16 in. dia.

Flumed onto these plates, the peas drop through the perforations while the rubber paddles sweep the end of

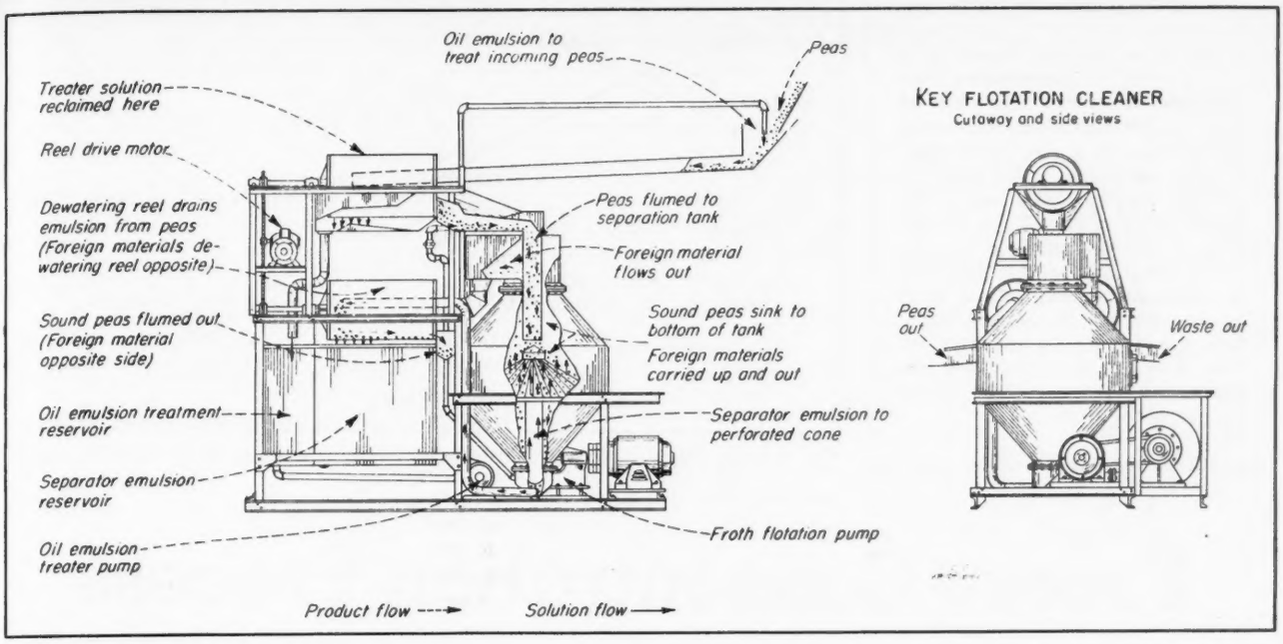


LOFTY 35-ft. fixed boom is "out" and new 12-ft. swivel boom is "in" on company's latest hydraulically powered hoist.

New hoists simplify handling of vines, are adaptable to gasoline-driven viners, and can be used in any packing locality. Shorter booms facilitate moving of hoists.


Electric controlled four-way hydraulic valve controlling hydraulic cylinder
Swinging lifting boom
Oil hydraulic pump supplying power to hydraulic cylinder
"Key Chinaman" viner feed regulators
Hydraulic cylinder to operate lifting boom
Vine fork
Electric switch controls fourway hydraulic valve

Froth Flotation Cleaner Removes Troublesome Foreign Matter


Oil emulsion to treat incoming peas
Peas
Treater solution reclaimed here
Reel drive motor
Dewatering reel drains emulsion from peas (Foreign materials de-watering reel opposite)
Peas flumed to separation tank
Foreign material flows out
Sound peas flumed out (Foreign material opposite side)
Sound peas sink to bottom of tank
Foreign materials carried up and out
Oil emulsion treatment reservoir
Separator emulsion to perforated cone
Separator emulsion reservoir
Froth flotation pump
Oil emulsion treater pump
Product flow
Solution flow
KEY FLOTATION CLEANER
Cutaway and side views
Peas out
Waste out

CLEANERS, located in separator scale house, separate extraneous matter from vined peas by froth flotation cleaning method. First step in cleaning consists of wetting peas with an emulsion, and draining them in a de-watering reel. Coming from de-watering reel, peas next drop into a hopper and are flumed in froth emulsion down a conductor pipe inside separator tank. Lacking buoyancy, peas sink to bottom of tank, whereupon foreign matter is carried through outlet port to a waste recovery bin.

the scalper, to remove foreign matter, which goes to the pit silo. The scalper is powered by a ¼-hp. gear-head motor.

The flow of peas from the scalpers may be directed into any one of the four master flumes. This makes it possible to keep each of the two varieties separate. These flumes carry the peas to the separator-scale house.

Froth Flotation Cleaner

Cleaning vined green peas is done with the Key Froth Flotation Cleaner, which utilizes the same principles as an earlier unit developed by A. M. Neubert and M. K. Veldhuis of the U. S. Fruit & Vegetable Laboratory, Pullman, Wash. (previously reported in Food Industries, Vol. 17, p. 494-497 and 608-616). However, in design and some operation characteristics, this cleaner differs from the original model.

The problem of separating vined peas from extraneous material has always been of significant importance to canners and freezers. Even prior to the original Neubert-Veldhuis model, various methods or special processes were used to obtain peas relatively free of foreign material. However, certain weeds frequently found in pea fields yield flower or seed parts not effectively removed from the vined peas by these earlier processes.

Berries from nightshade *(Solanum nigrum)*, buds from Canada Thistle *(Cirsium arvenese)*, flowers of the dog fennel *(Anthemis cotula)* and seeds from tar weed *(Amsinckia intermedia)* are among the most difficult to separate from peas. These materials would flow along until they reached the picking belts. But, due to the amount of this material, removal by hand-sorting on the belts was not deemed fully satisfactory.

Because of their close resemblance to peas, the manual removal of nightshade berries was particularly difficult. Losses of peas due to these berries have been estimated at from 3 to 10 percent in one Northwest region. In addition to removing extraneous material, the separation of broken peas and skins from the sound peas required care and time in handsorting.

All flotation cleaners are designed to be used in addition to other types of cleaners which are employed for removal of heavier foreign materials.

Peas enter the separator-scale house in one of the master flumes and drop into de-watering reels. The water, having conveyed and washed the peas, now is discarded from the process and used for irrigation purposes on company owned acreage. There are three flotation cleaners in this plant.

The froth flotation cleaning process is divided into two operations. The first step consists of wetting the product with an emulsion, followed by draining in a de-watering reel. This step is called the "treater". Wetting the product in the "treater" solution prepares it for selective bubble attachment in the froth emulsion. The product acquires a thin layer of oil on its surfaces during this treatment.

Coming from the de-watering reel, the product takes its second step when it drops into a hopper and is flumed in the froth emulsion down a conductor pipe inside the separator tank. Lacking the buoyancy of the foreign material, the peas sink, and the extraneous matter is carried to an outlet port.

The froth emulsion is composed of oil-in-water and a detergent (usually sodium lauryl sulphate) in which air is incorporated in small bubbles. The foaming agent is added to maintain the stability of the foam and to aid in emulsifying the oil. The pump used to supply the liquid and maintain the foam is specially built. It is belt-driven and powered by a 10-hp., 1200-rpm. motor. The casing of the pump is all aluminum. Its impeller, made of magnesium alloy, may be adjusted so that it incorporates from 20 to 50 percent air with the separator liquid. The frothed emulsion is introduced by this pump into the separator tank through a perforated cone located near the center of the tank.

As the sound peas sink to the bottom of the tank, they are carried by gravity flow in the emulsion liquid through a discharge pipe to a de-watering reel. The level of the discharge pipe is 12 in. below the head of the cleaning tank. The emulsion is recovered in the reservoir directly under this de-watering reel, and the peas are flumed, in fresh water, to another de-watering reel located above the hopper of the volumetric scales. The refuse is dropped, from the outlet port, into a de-watering reel, where the emulsion is recovered. Flumed to a waste recovery bin, the

(Continued on page 209)

Progress Report

This is a progress report on a new process for concentrating heat sensitive materials. The method rests on the control of ice crystal growth in such a way as to effect a clean separation of ice and concentrate with negligible loss of dissolved solids in the ice. A general idea of the capabilities of the process is given here. As further work is completed, licenses will no doubt be awarded and commercial installations made. More information will then become available and the sphere of usefulness will be further defined.—*The Editors.*

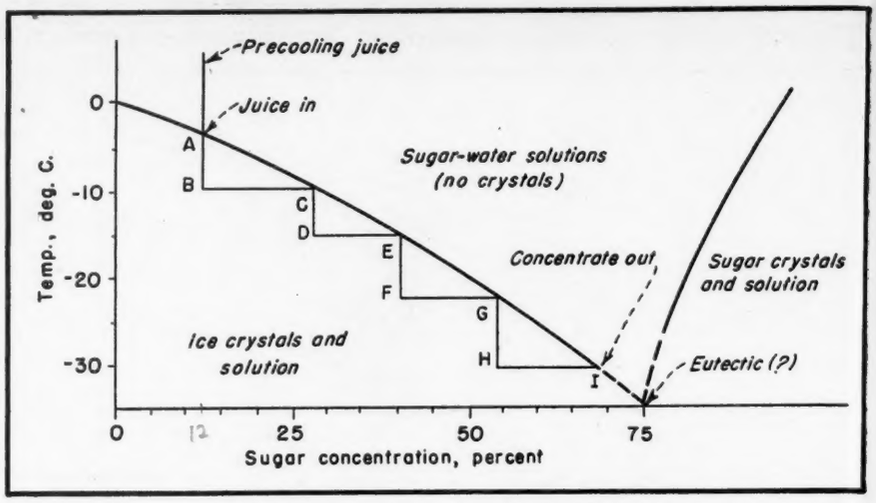


FIG. 1. Approximate-freezing-point diagram for solutions containing citrus fruit sugars.

Freeze-Concentration Process Employs New Approach

New pilot unit concentrates fruit and vegetable juices, milk, coffee, wine and beer. Controlled ice crystal growth minimizes solids loss

BY THEODORE R. OLIVE
Associate Editor
Chemical Engineering

A PROCESS which may exert a revolutionary effect on the concentration of fruit and vegetable juices, and other heat sensitive food products, is now approaching the commercial stage in the laboratory of Commonwealth Engineering Co. of Ohio, at Dayton. Developed in the last several months by this concern's technical director, Dr. G. L. Cunningham, the process makes use of new principles in freezing to remove a large part of the water from the original juice or solution, with only negligible loss of valuable dissolved material. Since concentration takes place at atmospheric pressure and at refrigeration temperatures, there is no tendency toward heat damage, no loss of vitamin content, and no removal of readily volatile aromatics or other constituents contributing to aroma or flavor.

Although a number of products have been investigated, most of the work has been done with orange juice of both low and high oil content. When reconstituted with water, this product appears to be equal, or even superior, to fresh juice. Other fruit juices which have been concentrated successfully include apple, cherry, grapefruit and lime. In general, these can be concentrated to about one-sixth of the original volume, with a final solids content of the same order as the 68 percent solids attained with orange juice.

Vegetable juices such as onion have also been concentrated. In fact, tomato juice, in which the pulp interferes with the process, is the only juice at this stage which has not responded favorably. Other products that have been successfully concentrated to date include coffee, milk, beer, wine and cordials.

There is nothing new in the idea of concentrating water solutions by freezing. What is new in the Cunningham process is the employment of controlled ice crystal growth in such a way as to effect a clean separation of ice and concentrate, with negligible loss of values in the ice. In the concentration of fruit juices, for example, the ice carries with it only about one percent of the sugar initially present, in spite of the fact that nearly 90 percent of the original water is removed as ice.

Procedure in earlier freeze-concentration processes generally has been to freeze the dilute solution or juice to a semi-solid or mushy viscous mass and then to attempt to separate the ice crystals by draining, centrifuging or pressure. A clean separation in such a process is impossible, first because of the high viscosity of the concentrate, and second because of occlusion of liquid in the crystals during their uncontrolled growth.

In the new process ice crystals grow in several stages and in a countercurrent relation to the flow of juice or solution. The largest crystals are in contact with the most dilute and least viscous liquid. Then a simple centrifuging is all that is needed to effect nearly complete separation. At no stage does the material being concentrated reach a mushy condition which would make separation difficult.

Apparently the only limitation on the process is the fact that, since it depends on the phase diagram relations of solvent and solute, the concentration cannot be carried quite as far as the eutectic point where sugar crystals separate.

The situation can be made clear by reference to Fig. 1, which is a phase or freezing point diagram of sugar-water solutions. The sugar is a mix-

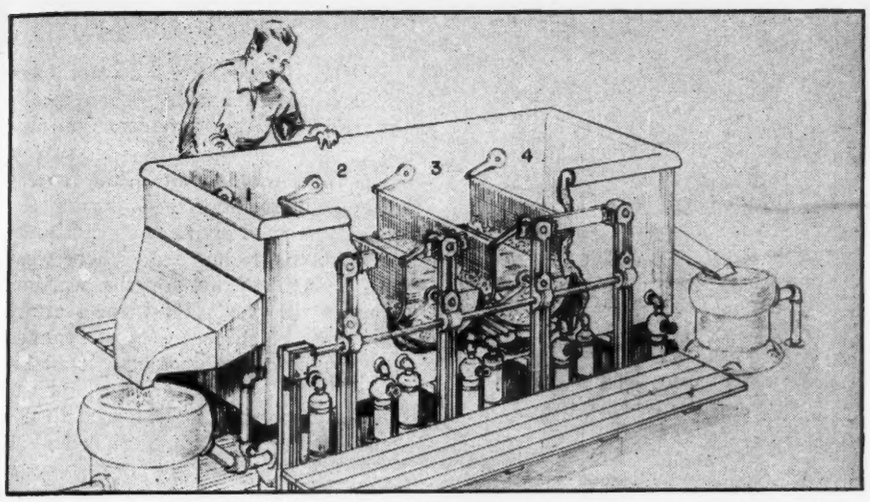


FIG. 2. Commonwealth's pilot freeze-concentrating unit for fruit and vegetable juices.

ture of invert sugars and sucrose such as occurs in citrus juices. Although the diagram for an actual fruit juice would be somewhat different, it will, for all practical purposes, illustrate what occurs in orange juice concentration.

This diagram is a plot of sugar concentration against temperature. It shows the approximate boundaries between water-sugar solutions which exist above the two curves, and the solid phases that separate from the solution at temperatures and concentrations below the curves. At points below the left hand curve, it may be considered that the solution is supersaturated with respect to water and therefore ice begins to separate. Below the right hand curve, however, the solution is supersaturated with respect to sugar, and sugar crystals separate out. The intersection of the curves is the eutectic point which represents the lowest freezing point obtainable at any sugar-water concentration. Its exact location is unknown, but occurs in the neighborhood of 75 percent sugar at about -35 deg. C. Since both ice and sugar crystals occur at the eutectic point, it is obvious that a process for removing water by freezing cannot attain a higher than eutectic sugar concentration.

Pilot Unit

The phase diagram can also be used to explain the operation of the new pilot plant machine just completed by Commonwealth. The machine, shown in Fig. 2, is extremely simple and would appear to involve considerably smaller capital investment than other concentration methods. Basically, it consists of a cascade of four semi-cylindrical metal troughs. Each trough is provided with a slowly moving screen which separates the suspended ice crystals from the solution and lifts them into the next higher trough. The troughs are insulated and jacketed, with refrigerated brine in the jackets. Refrigerant—preferably ammonia—evaporates in coils suspended in the brine, with refrigerant flow counter to the flow of liquid being concentrated. Baffles between the various sections of the jacket prevent brine circulation and maintain the desired temperature differentials among the four troughs.

Because the greater part of the experimental work has been done on orange juice, operation of the machine, on this product will be described. The fresh juice at room temperature, containing about 12½ percent solids, is cooled initially to *A* on Fig. 1—about -3 deg. C., by heat exchange with the ice leaving the process. The cold water produced in melting this ice can then be used in condensing the refrigerant, thus contributing to high refrigerating efficiency.

The precooled juice enters the highest trough at *A* where it is supercooled to *B*—about -10 deg. C. Actually, ice begins to form almost immediately as the cooling takes place so that the concentration increases along some intermediate path to *C* during the cooling. At this temperature and concentration the solution overflows to the second trough where further cooling to *D* and concentration to *E* takes place.

From the second trough the solution overflows in turn to the third and fourth troughs where the temperature is further reduced and the concentration increased in turn to *F* and *G* and then to *H* and *I*. Finally, the solution overflows the fourth trough at about 68 percent solids and at a temperature of about -30 deg. C. At this concentration the product may be frozen or kept refrigerated for shipment, although this is unnecessary since the sugar content is high enough to inhibit growth.

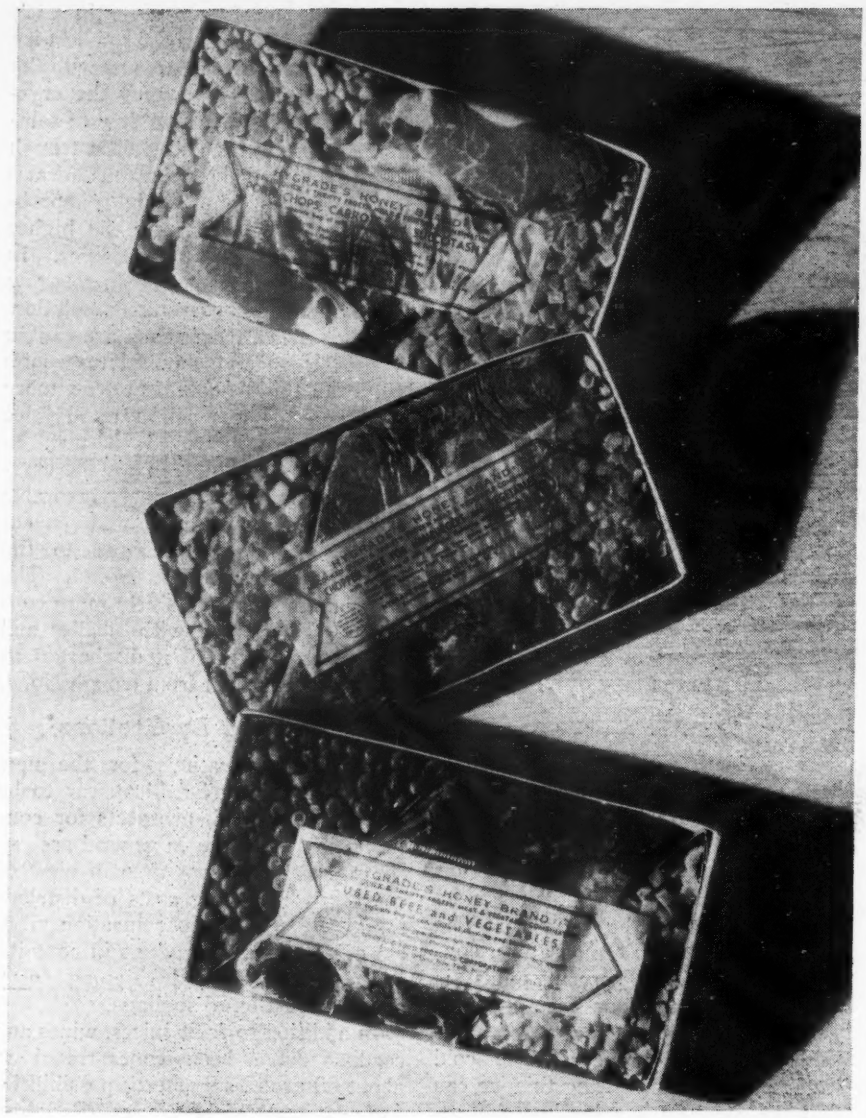
Although the formation of ice crystals has been mentioned, it has not been explained exactly how this takes place. The moving screens in each trough prevent any but the smallest ice crystals from moving forward with the juice. Instead, they convey the crystals backward against the flow of solution. In the lowest and coolest trough (No. 4) there is spontaneous formation of ice crystal nuclei and it is probable also that nuclei from the higher troughs may enter with the juice. In any event, these nuclei begin to grow in the most concentrated solution, reaching a size where they are caught by the screen and elevated to trough No. 3. In this trough they grow more rapidly in the less concentrated juice and then are conveyed in turn to troughs Nos. 2 and 1. Thus the crystals grow under increasingly favorable conditions of temperature and concentration until they discharge to the centrifuge from trough No. 1. The juice becomes progressively more concentrated in contact with smaller and smaller crystals until it discharges as the finished product from trough No. 4.

Food Field Applications

Possible applications for the new process in the food field appear to be numerous. Indeed, prospects for concentration processes in general are excellent at the present time in view of constantly mounting costs of distribution. Any efficient concentration process offers potential savings in containers, in handling and shipping costs, and in reduction of spoilage.

In addition to fruit juices, wines and cordials have been concentrated to about 80 proof, suggesting possibilities for new sorts of beverages. Beer can be similarly raised to about 40 percent alcohol content, a fact which conceivably may bring about important changes in distribution provided the trade and the public can be educated to the idea of diluting and carbonating this product, or of diluting it with carbonated water, before use.

Successful use of the process is also indicated for producing coffee and milk concentrates. Coffee can be concentrated to a fraction of its original bulk. It may be marketed as a concentrated sirup for bakery or home use, or the concentrate might be converted to crystalline form by conventional methods. In the case of whole milk, which contains 12 to 14 percent solids initially, concentration has been carried to over 30 percent solids, with the removal of about two-thirds of the original water. Concentration to about 28 percent is currently considered the safe point owing to possible breaking of the emulsion at higher concentrations. As in the case of coffee, markets might be developed for the liquid concentrate, although again the process might serve to preconcentrate for milk powder manufacture.



FROZEN DINNERS

Though Problems Beset Packers A Favorable Future Is Seen

JOHN V. ZIEMBA
Assistant Editor
"Food Industries"

"IF THE frozen-meal processor applies ingenuity and foresight, he stands an excellent chance of making his current business more satisfactory and his future business profitable—this despite the fact that his path through these early postwar years remains thorny."

This is the considered opinion of Samuel Slotkin, who in but a few short years piloted his company, Hygrade Food Products Corp., N. Y. C., to high rank in the frozen food industry.

Mr. Slotkin believes frozen meal processing has yet to "graduate" from its primary stage. These fundamental hurdles are still faced:

1. There are still some problems in projecting the needed rigid bacteriological control of ready-to-eat meals, especially since they are not put up in sterile condition like canned foods.

2. Industry continues to seek the ideal package, which will adequately protect the product.

3. Packaging lines are not entirely automatic, nor do they operate at speeds comparable to canning lines.

4. Processors find some cooked foods more difficult to freeze than uncooked foods.

5. Many retail stores do not have the facilities to handle frozen meals, nor do housewives have means to store them.

Despite these difficulties, the frozen-meal business flourished during the war. It seemed to have "graduated" when it actually had not. There were three prime reasons for the wartime "flash in the pan": First, the scarcity of metal containers. Most canned cooked foods were no longer available due to the restrictions placed on tin. Hence, processors were forced to use substitute packaging materials and to freeze as a means of preservation. Second, rationing and the storage of other processed foods. These conditions created a favorable market for frozen, ready-to-eat meals. They were easily available and of low ration-point value. Third, the saving of time and labor. The housewife engaged in war work had little time for preparing meals.

While the war gave impetus to the industry, it also created over-optimism. Many processors did not foresee where technical problems—like packaging, handling or storing—would lead them.

Now in postwar years, however, the conditions are different. Sales have dropped considerably. Reasons for this decline:

1. The sharp increase in food prices which followed the removal of price controls.

2. Availability of metal containers. Processors gradually went back to canning cooked foods, as the tin can situation eased. They did this because canned cooked meals are easier to prepare and handle than frozen meals. Furthermore, their plants were already equipped to can cooked foods. Housewives tended to go back to cans, too.

3. Since housewives no longer work in war plants, they now have more time to prepare their own meals.

Solution to Problems

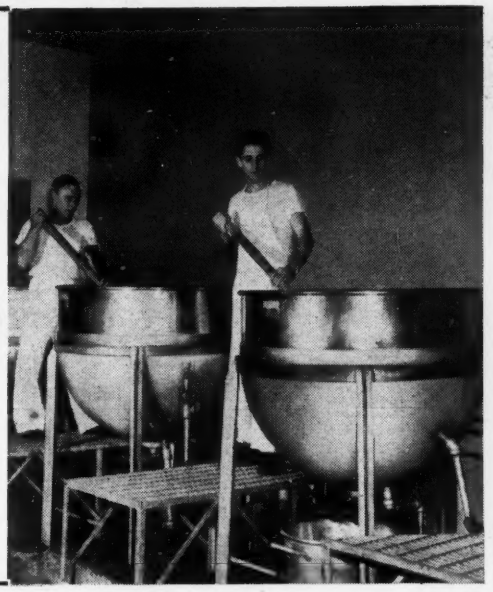
The question is how can these problems be solved. Several approaches have been considered.

Hygrade is one of the firms taking a lead in drafting strategy to solve these problems. This company is attacking the problems in three ways by: (1) Limiting its production of frozen, cooked meals to a few specialty items that have won consumer acceptance; (2) offering an uncooked, frozen combination meat and vegetable dinner; and (3) providing frozen, uncooked meats, which can be purchased along with separate packages of vegetables —frozen or canned.

Let us consider in more detail the five basic problems listed at the beginning of this article:

Beef Stew:

Ever popular, the cooked stew is a basic staple in Hygrade's well-planned program



1. **COOKING beef stew meat and vegetable sauce separately in steam-jacketed kettles at Hygrade's Boston plant.**

2. **KNOCKED-DOWN cartons are set up on carton-forming machines. Cartons are waxed and lined with cellophane.**

Turn Page

On the control of bacteria in frozen dinners, progress will continue. Emphasis will be placed on the establishment of microbiological standards for the purpose of reducing the number of microorganisms present in the frozen food. The success will be determined by quicker handling and more sanitary plant practices.

Newer frozen food packages are being developed with lower moisture-vapor transmission, absence of leakage, and other protective functions of an ideal package. The rectangular, fiberboard containers with mechanically sealed metal ends represents one of the newer packaging developments.

Granted that production lines are not completely automatic today, continuous mechanization of these lines will be realized following a more standardization of the food items and the development of proper packages.

With further research, those cooked foods now difficult to freeze, will no longer be a problem. Better knowledge of preparation and freezing practices will show the way. For example, items containing starchy sauces may require modifications in the formula to avoid separation in the sauces following reheating. Or, new starches may be developed which, when added to the formula, will prevent separation.

Frozen Cooked Meals

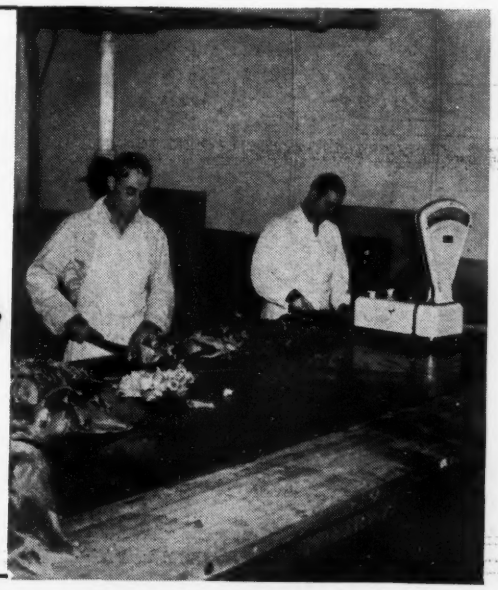
In 1946, more than 12,000,000 lb. of frozen cooked meals were produced at Hygrade's plants. Production has since been concentrated at the Boston plant, where the company puts up frozen foods at the rate of 12,000 packages a day. The number of items has also been reduced from 18 to 5. Those now emphasized are beef and lamb stews, Swiss and pepper steaks, and corned beef hash.

At the Boston plant, sauces, gravies, meats and vegetables are prepared in 150-gal. steam-jacketed kettles. When cooked, these items are emptied into stainless steel tank trucks and wheeled to the filling station. Here, the meats are weighed and filled by hand into cellophane-lined, waxed cartons that have previously been set up on carton-forming machines.

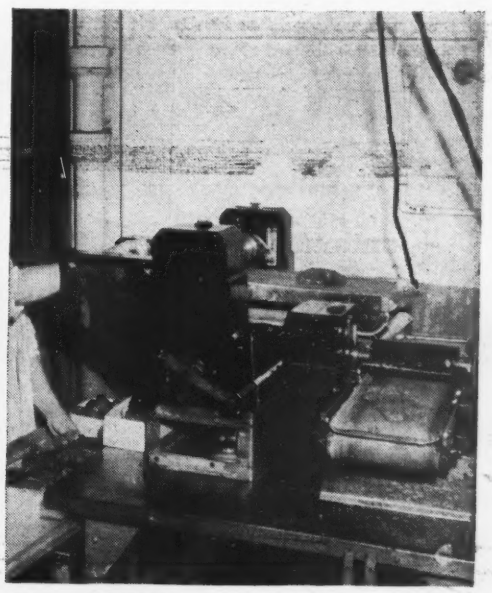
The cartons are then fed, via belt conveyor, to the sauce, gravy or vegetable filling machine, where they are

Meat Cuts:

Also fundamental in company scheme is the fine meat cut (uncooked) — as nucleus of a dinner



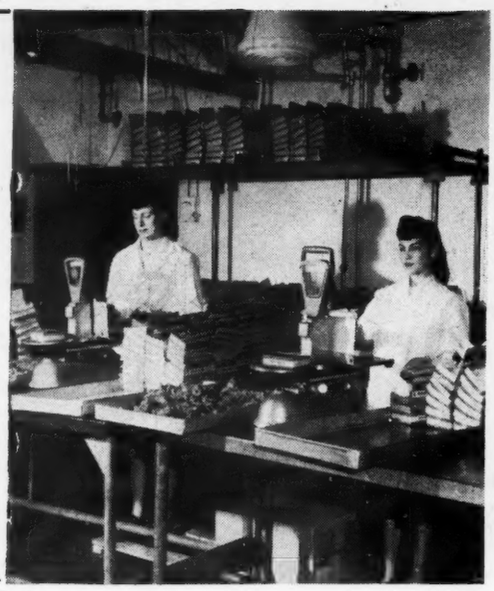
1. **BUTCHERS cut and trim meats, ready for package. Meats prepared: Chops, steaks, roasts, cubed meats, and ground beef.**



2. **SPECIAL machine cubes such meats as veal, lamb, and pork. Machines also slice steaks and chops to uniform thicknesses.**

Turn Page

Beef Stew (Continued from preceding page)



3. **STEW MEAT is weighed and filled into cartons. Meat must be packaged quickly to prevent discoloration of its surface.**

4. **VEGETABLES and sauce are next filled into cartons containing meat. Cartons are then closed, put on trays, and frozen.**

filled automaticaly, two at a time. Finally the cartons are closed by hand, placed on freezer trays, and loaded into plate freezers.

Combination Dinners

There were two reasons for Slotkin's development of the "Quick and Thrifty" frozen, uncooked meat and vegetable combination dinners: First, to offer the customer thrifty, easy-to-prepare meals. Second, to overcome difficulties associated with the freezing of cooked dinners by freezing the uncooked ones instead.

He foresees the day when frozen dinners may be "flash cooked" in retail stores or in the basements of large apartments. This would be possible, he believes, through new developments made in electronic cooking equipment.

Combination frozen meat and vegetable dinners are now being test-marketed in two department stores—Gimbel's in New York and Jordan Marsh's in Boston.

The new combination meals are thrifty because there is no waste. And since there is no overbuying of meats and vegetables on the part of the customer, there are no leftovers. Several packages can be stored in the home freezer, making it easier to budget weekly expenses on food.

Easy to Prepare

The dinners are quick to prepare because shopping is easier—the customer needs only to serve herself from the frozen food display cases. Furthermore, meats and vegetables do not have to be cleaned or otherwise prepared.

The meat-vegetable combinations are packed in waxed cartons by hand. Cartons are then overwrapped with cellophane. Cardboard dividers are used to separate the meat from the vegetables. Also placed in the package are spices, which are heat sealed in small cellophane bags. Cartons are finally frozen.

Meats like cubed beef, cubed lamb, stew meats, hamburger patties, sliced veal cutlets, and sliced calf's liver are check-weighed. On the other hand, catch-weights are made on the different kinds of chops and steaks as well as on the chicken used for fricasse or frying.

Meat Cuts (Continued from preceding page)

3. **PACKAGING LINE. Here, girls weigh meats after preparation by butchers. Cuts are then packed into cartons.**

4. **CARTONS travel on conveyor to Oliver Wrapper, where they are packaged in cellophane. Cartons then go to freezers.**

Frozen Meats

In the company's frozen meat procedure, the meats are first cut and trimmed by skilled butchers. Select cuts are sliced into steaks. Pork loins are cut into chops by means of a band saw—each chop having a uniform thickness. Beef trimmings are machine-ground into hamburger meat. Meats for stewing are diced. Certain beef and lamb cuts are cubed with special cubing machines.

After the butchers have prepared the various meat cuts for the retail package, the meats are packed by hand into waxed cartons. Some meats are first wrapped in cellophane before they are packed into the cartons. Girls weigh each package and indicate the weight of the meats on labels affixed to the package.

The cartons travel on a conveyor to an Oliver Wrapping Machine, where they are overwrapped in cellophane and then heat sealed. These packages are placed on freezer trays, then loaded into plate freezers. After the packages have been frozen to —10 deg. F., they are immediately packed into shipping cases and stored in freezers (O deg. F., or lower). Shipments are made to other plants in refrigerator cars. All frozen foods are distributed from the various plants in refrigerated trucks, which take the products directly to the retailers.

The company puts up these retail cuts of frozen meats for the housewife who wishes to choose her own vegetables and not leave the choice up to the frozen food packer. The housewife can, in this way, select her frozen meats. Then she can decide what vegetables—frozen or canned—should go with the meat.

SAMUEL SLOTKIN, president of Hygrade Food Products Corp., N. Y. C., has been a pioneer in packaging fresh and frozen meats, as well as precooked, frozen meals, for retail trade. Stores called "butcherless shops," handled his prepackaged meats in 1930.

Hygrade's Three Groups of Frozen Foods

These are the frozen dinner items manufactured by Hygrade Food Products Corp.'s Frozen Food Division.

They are listed in three categories: (A) Combination meat and vegetable dinners (uncooked), (B) precooked meals, and (C) cuts of frozen meats—leaving the choice of vegetables (frozen or otherwise) to the customer.

A—Frozen Uncooked Meat—Vegetable Combinations

No. 1. Chopped beef for hamburger and mixed vegetables
No. 2. Cubed beef-peas-carrots
No. 3. Cubed lamb-lima beans-carrots
No. 4. Cubed veal-mixed vegetables
No. 5. Pork chops-succotash-carrots
No. 6. Veal cutlets-elbow macaroni-spinach-mushrooms
No. 7. Loin lamb chops - lima beans-carrots
No. 8. Rib lamb chops - lima beans-carrots
No. 9. Sirloin beef steak-mixed peas-carrots-corn-mushrooms
No. 10. Sliced calf's liver-carrots-spinach
No. 11. Half chicken (fryer)-peas-carrots-mushrooms
No. 12. Half fowl for fricassee-peas-carrots-mushrooms

B—Precooked Frozen Meals

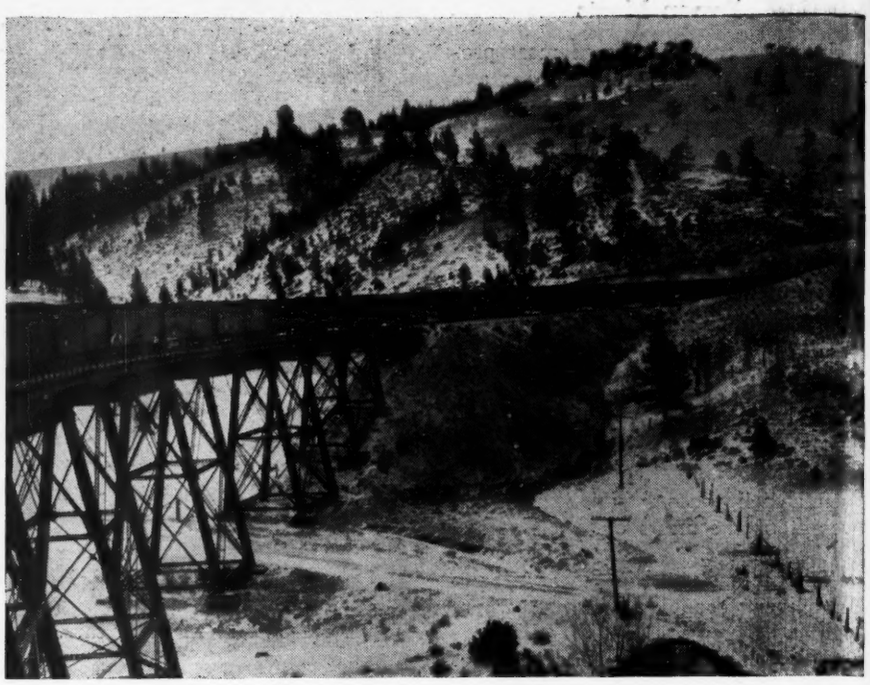
No. 1. Beef stew
No. 2. Lamb stew
No. 3. Swiss steak
No. 4. Pepper steak
No. 5. Corned beef hash

C—Frozen Meat Cuts

No. 1. Hamburger—8 oz. squares, cellophane - wrapped and packed 12 to the carton.
No. 2. Hamburger—4-oz. patties, cellophane - wrapped and packed four to the carton.
No. 3. Dinner steaks—two steaks to the carton, each steak cellophane wrapped.
No. 4. Sandwich steaks—12-oz. to the carton, each steak cellophane-wrapped and weighing 2½ to 3 oz.
No. 5. Pork chops (center cut)—three chops to the tray.
No. 6. Veal cutlets—2½ to 3 oz. per cutlet, 12 oz. to tray.

PRECOOKED meals (B-group) are seen at left, and meat cuts (C-group) at right. Combination packets (A-group) are pictured in photo at beginning of this article.

Effectiveness of reefer car heaters, with and without air-circulating fans, is shown in tests conducted by USDA. The studies were carried out on carload shipments of fruit during two winter seasons, using standard and new improved heaters



Under Severe Winter Conditions . . .

Heaters Plus Fans

AIR-CIRCULATING FANS appear to be a "must" for the protection of carload shipments of fruit under heater service in cold weather—judging from a series of tests conducted by the Assoc. of Am. Railroads and the USDA the last two winters. Results of the tests, recently made available in official form, by the USDA, indicate the pertinent need for more fan-equipped reefers.

In the second year's tests, standard non-fan cars were used in conjunction with improved heaters thermostatically controlled. But without the fans no consistent advantage was shown over the standard charcoal heaters.

On the other hand, excellent results had been obtained the previous winter in tests using cars equipped with air-circulating fans and thermostatically controlled heaters. In fact, fruit was found to arrive at destination with less change in condition during these tests than ever before noted under heater service.

Several improvements in design and construction of the heaters had been made by the manufacturers following the tests conducted in 1946-47. This year it was decided to concentrate the studies on the performance of the heaters under the most adverse operating conditions. Therefore only non-fan cars were used in the transit phase.

W. H. Redit, mechanical engineer, and Edwin Smith, senior horticulturist, were in charge of tests for the USDA.

Four transit tests were run from Wenatchee, Wash. and two from Yakima., Wash. All runs terminated in Chicago. Tests were run in pairs spaced two or three days apart to assure better chances of encountering an appropriate cold spell.

Alcohol and charcoal heaters were used in the study. The alcohol type had a pilot flame to light the main burner when activated by the thermostat. Included in this group were heaters of the trade names: Solar, Preco, Payne, Clifford Fan "A", Clifford Fan "B", Clifford Thermo non-fan and FGE Steam Turbine.

The charcoal type required manual lighting and darkening, but had automatic control of the burning rate based on bunker air temperatures. Included in this category were heaters of the trade names: Klauer and Simplex.

Temperature Measurement

Two types of temperature indicating equipment were used. Thermocouples connected to electronic indicators gave commodity and air temperatures in the AAR business car through specially developed cables and switches.

Distant-reading electrical resistance thermometers were used when the train made stops enroute.

The tests showed that all the heaters gave reasonable protection to the bottom of the loads, but undesirably high temperatures were encountered in the top. This was caused partly by unnecessary burning of the heaters through faulty thermostat operation, heat developed by the pilot lights, and by the lack of adequate air circulation.

Thermostatic Control

Best all around protection against freezing was found with the fan type thermostatically controlled alcohol heaters. However, in mild weather this type with the fan running continuously tended to heat the fruit excessively.

The charcoal heaters with thermostatically controlled draft, operated under Carrier Protective Service rules, gave as good protection as the non-fan alcohol heaters without as objectionable rise in top temperatures. In addition, the total heat output was only about ⅔ that of the alcohol type.

Operation of the thermostats was found to be improved over last year's tests and in general was satisfactory.

However, proper calibration remains as a most important problem. Some of the dangers from overheating might be reduced if adequate provision were made to insure proper calibration of thermostats periodically and to insure operation within 1 deg. desired.

Wicks, generally, were found satisfactory. However, difficulties were

. . . Study of Heater Installations . . .

. . . And Performance Shows—

Mean Safer Fruit Transit

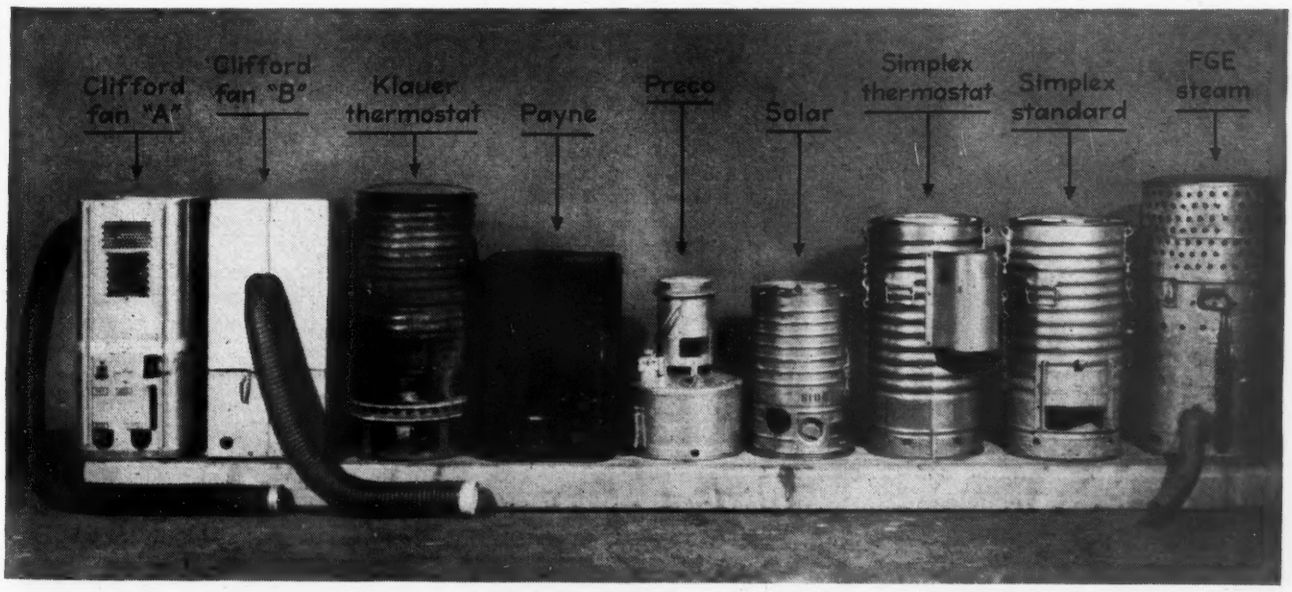
foreseen with the use of float chambers, where foreign matter can foul the needle valve or jet.

The method of loading cars had little effect on commodity temperatures obtained with fan type heaters. When cars are loaded solidly, convection type heaters should be placed in one bunker. With divided or braced loads, results show that one heater should be installed in each end.

Superior performance of fan cars was again demonstrated in a test with one type of heater. As compared with the use of the same heater in a standard non-fan car in the same tests, maximum temperature in the fan car was 13 deg. lower and minimum was 2 to 3 deg. higher than in the standard.

Therefore until enough fan cars are available to handle the winter movement of apples and pears from the Northwest, a requirement of the universal use of thermostatically controlled heaters is not recommended. The USDA indicates that these facts have been so well established by the results of the past two seasons' work that further road tests are not needed.

A complete file of all the data obtained is in the possession of the Refrigerator Car Research Bureau, Assn. of American Railroads, Chicago, and the Bureau of plant Industry, Soils and Agricultural Engineering, Beltsville, Md.



These Were the Heaters Tested

Grocery Stores Best Source Of Vitamins

Food processors are urged to retain or replace more of the essential nutrients

By BERNARD L. OSER, Director
Food Research Laboratories
Long Island City, N. Y.

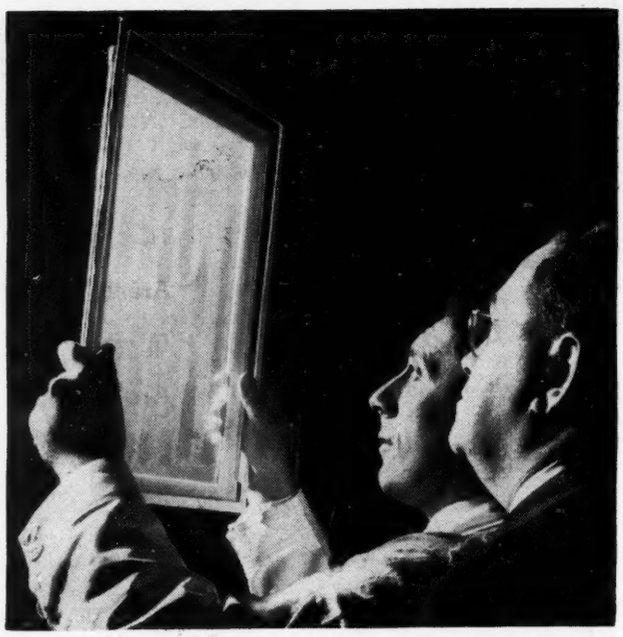


Photo by Roy Stevens

AUTHOR (right) studies new chromatographic test, useful in laboratory control of vitamin levels in processed foods.

THE NEW SCIENCE of vitamins has had a large influence on developments in the food industry. Methods of manufacture and processing have been focused frequently on the retention of vitamin content. The effects of temperature, air, light, mineral contamination and moisture content on preservation of vitamin values have been determining factors in the selection of the materials and methods of manufacture, packaging, storing and distribution of many manufactured food items.

Products not previously recognized as foods or as materials which could be incorporated in foods have come to be prized by reason of their vitamin content. Among them are yeast, the bran or germ of various grains, rose hips, green walnuts, and fish liver oils or concentrates.

The rising curve of consumption of vegetables, fruits and dairy products during the past few decades has been largely due to the education of the housewife on the subject of vitamins in nutrition.

Isolation of vitamins from natural sources in highly concentrated form, and their ultimate commercial synthesis, inevitably culminated in actual addition of vitamins to foods, either to restore those lost in the course of refining or processing, or simply because such foods are appropriate carriers for vitamins which they do not normally contain.

Incentives and Obstacles

Throughout this period of development, there have been incentives as well as obstacles. The incentives, it may as well be admitted, have frequently been of a commercial nature. The obstacles sometimes originated as a result of competition between different foods.

In this land of free enterprise it must be considered legitimate for competition to exist not only within industries but also between industries. Railroads compete among themselves and with airlines; coal dealers compete among themselves and with oil dealers; corner druggists compete among themselves and with corner grocers. So long as such competition is fair and does not victimize the public by jeopardizing its freedom of choice, it is consistent with our system of free competitive enterprise.

But when misrepresentation of the facts or specious arguments are employed politically to influence legislation which has the effect of depriving the public of wholesome foods at low cost, one must question how free and how fair is this system.

Benefits Withheld

It is hardly necessary to elaborate on how the dairy industry has, in effect, withheld vitamin A-enriched margarine from many of our population and penalized others taxwise for the privilege of buying it. This product represents one of the most creditable achievements of modern food technology, one in which vitamin research has played a significant role; yet artificial barriers continue to limit its use even when butter is beyond the reach of consumers at lower economic levels.

Even if all margarine equalled butter in flavor, which I do not think it does, I believe there would be sufficient market for both products without the punitive tax on margarine. And if not, perhaps it would be better to restore the dairy industry to a whole milk rather than a butterfat basis.

Filled Milk Problem

In a similar vein, I believe that the Filled Milk Act is a legislative excrescence which should be repealed. Even if practices current in 1923 justified its passage, this law has no place in the light of present knowledge of nutri-

Nutritional Improvement

Dr. Oser's article is the second in the new FOOD INDUSTRIES series on the nutritional improvement of foods.

The introductory article, "Nutritional Improvement Challenges Processors," appeared last month. It discussed some of the problems that arise in developing, preparing and labeling foods having improved nutritional qualities.

This month's article is based on a paper read by the author at a meeting of the New York section of the Institute of Food Technologists. Dr. Oser takes the industry to task for failing to exploit properly the existing knowledge of vitamins. In reaching his conclusions, he drew on his experience as an expert witness, on his familiarity with state legislation, and on his records of official hearings.

Not all readers will agree with the article. It is presented as a thought-provoking contribution in this series.

—The Editors.

tion. The substitution of vitaminized vegetable oil for the butterfat in evaporated milk results in a product which bears the same relation to evaporated milk that margarine does to butter.

The original definition for filled milk antedated vitaminization procedures, and hence the product lacked the fat-soluble vitamins originally present in the milk from which it was derived. It was nutritionally inferior to evaporated milk and its substitution therefor should have been proscribed. However, other laws exist to prevent substitution, and the sale of vitaminized filled milk, which even the courts conceded to be nutritionally equal to whole milk, could today be controlled so as to avoid such substitution. It hardly does credit to the dairy industry to invoke legislation which prevents access to a cheap, wholesome, nutritious food—one which, incidentally, provides a potentially large market for skim milk.

Fortification Opposed

Just as butter and margarine, being fats consumed in unheated form, are suitable vehicles for the incorporation of vitamin A in the diet, fruit juices are appropriate media for the water-soluble vitamin ascorbic acid. Nevertheless, opposition has not yet been withdrawn from the fortification of those fruit juices which do not naturally contain significant amounts of this vitamin.

In particular the effort to obtain approval of the American Medical Assn. for the addition of vitamin C to apple juice has not yet "borne fruit," despite the demonstration in our laboratories and elsewhere that this juice is an excellent carrier of ascorbic acid. Having abandoned its earlier opposition to the "therapeutically suggestive" name ascorbic acid, is it possible that the AMA still fears that vitamin C-fortified fruit juices will be used as self-medication for scurvy?

A somewhat similar situation exists in regard to tomato juice. The natural product shows a wide variation in vitamin C content due in part to varietal differences, climatic and soil conditions. Granted that efforts should be directed toward producing the best possible natural juice, what nutritional or economic objection can there be to permitting its enrichment with added vitamin C to some such appropriate minimum level, like 20 mg. per 100 ml? The possibility of vitamin C overdosage is so remote as not to warrant discussion.

Enrichment Levels Needed

Indiscriminate fortification of foods with vitamins should not be encouraged, but rather than obstruct attempts on the part of food manufacturers to effect such nutritional enhancement at little or no cost to the consumer, consideration should be given to more widespread fortification in conformity with certain basic principles and under appropriate controls. Fortification or restoration of any manufactured or processed food in a given category might be permitted to a level selected as representative for that category. Opposition to such enrichment, on the ground of enforcement difficulties, is just as specious as the early opposition to vitamin D milk for the reason that laboratory control was (and still is) a difficult problem.

It is a strange commentary on accepted practice that few limitations are placed upon the direct addition of vitamins to animal rations, the economic advantages of which are conceded by the farmer and cattle raiser. More rapid growth, increased milk or egg production, improved hatchability, etc., can readily be measured in dollars and cents. However, the efficiency of dietary transfer of vitamins to muscle, eggs or milk is so low as not to compare with the economy of direct fortification of human foods. One of the earlier methods of fortification of milk with vitamin D was to feed large doses to the cow. A few percent of the vitamin was transferred to the lacteal secretion, and the product was erroneously called "metabolized vitamin D milk". Such vitamin D milk has never been shown to possess any advantage over similar milk to which vitamin D was added directly or by irradiation; indeed its potency is even more difficult to control.

Extent of Fortification

It would be interesting to survey the extent of vitamin fortification of foods. Unfortunately, data are difficult to obtain. Government statistics are woefully inadequate or obsolete; and such data as are accumulated in the files of industry's sales or production departments are carefully guarded secrets.

Information does not seem to be available as to how much of the total milk production is fortified with vitamin D and the relative extent to which the various sources of vitamin D are used; likewise with respect to the vitamins in enriched flour, bread, pastes, cereals, rice, corn grits, etc.

It appears safe to say that complete data are not available and perhaps do not exist concerning the total number, variety or extent of vitamin fortification of cocoa mixes, confections, beverages, bread spreads, crackers, cake mixes and countless other prepared foods. In fact in assembling such statistics it would be difficult to draw the line between food and pharmaceutical products; or between the use of ascorbic acid as a vitamin and as an antioxidant. The manufacturers of synthetic vitamins cannot furnish information as to their ultimate disposition in the food, feed and drug industries. Statistical data as to the production and use of natural vitamin concentrates from fish liver or body oil, rice or wheat bran, wheat germ or soybean oil are likewise not accessible.

Promotion of Vitamins

While taking the industry somewhat to task, I should like to mention some of the ways in which, in my opinion, it has failed to exploit properly our knowledge of vitamins.

Vitamins by their very nature are constituents of foods, yet the food industry from almost the beginning has let the pharmaceutical industry and the medical professions take the lead in presenting them to the public. With few notable exceptions, the deliberate enhancement of the vitamin content of foods was exceedingly slow until enrichment of white flour became mandatory.

Instead of taking the initiative in advancing knowledge of dietary requirements and of how these were met by existing foods, the food industry seemed to be satisfied with having clinical nutritionists take the lead. As a result, the medical profession placed itself in a position where hardly a move could be made without its approval.

The unfortunate part about this situation, it seems to me, is that physicians

QUESTIONS EXAMINED BY DR. OSER RE VITAMINS IN FOODS:

- **Has legislation been influenced by misrepresentation of fact?**
- **Has the Filled Milk Act been working needless hardship?**
- **Why should the addition of vitamin C to fruit juice be opposed?**
- **Are there any reliable data on vitamin fortification of foods?**
- **In what ways have we failed to exploit knowledge of vitamins?**
- **Are we prone to "let George do it" in the field of vitamins?**

think of dietary problems in terms of deficiency disease conditions and are skeptical of the need for specific vitamins in cases where actual symptoms are not demonstrable.

The methods of diagnosis of early vitamin-deficiency disease conditions are difficult and beyond the reach of most practising physicians. Nutritionists, however, have been able to establish normal intake levels for many of the nutrients based on experiments on animals and on human subjects under various physiological conditions.

Such data emphasized the difference between the supply and the requirement for certain vitamins and minerals and constituted the quantitative basis for vitamin enrichment programs. It is, nevertheless, still considered expedient not to take a step in the direction of nutritional enhancement without the prior approval of the medical fraternity.

Initiative Needed

The food industry, on its own initiative, through the Nutrition Foundation and otherwise, has supported excellent researches into the nutritional requirements of human beings and into the nutritional contribution of foods as affected by conditions of manufacture and storage. It ought to exercise more initiative in putting this knowledge to practical use.

Why have the minimum daily requirements been "established" for only five vitamins, and then on the initiative of the Food & Drug Administration? Is the food industry content to stand by until either the government or the medical profession forces the next move in enlarging this list? Is it because the remaining vitamins—like pantothenic acid, biotin, pyridoxine, folacin (as folic or pteroylglutamic acid may soon be officially known) and the rest—seem to offer less likelihood of commercial exploitation, that no efforts seem to be made in advancing along this front? Are we to accept without question the recent suggestion that the B vitamins are synthesized in the human intestinal tract in nutritionally significant amounts?

Excesses of Advertising

It is my belief that much damage has been done to the promotion of foods for their vitamin content by the excesses of the advertising industry. Much vitamin advertising of the past two decades, especially but not exclusively that directed to the laity, has injured the food industry by reason of its sensationalism, exaggeration and over-simplification. (I use the past tense because I believe this phase of vitamin promotion has run its course.) There was a deplorable tendency to substitute the part for the whole. The vitamin D over-shadowed the milk; spinach became identified with iron, and enriched bread with vitamin B complex. This was carried to such a degree that the consumer lost perspective and became confused as to the relative importance of the individual nutrients, each of which, however, was expected to perform some miraculous feat.

The gullible public was told it could put on weight or take off weight, become more energetic or less irritable, have better teeth, more charm, easier parturition, or merely drive better at night. Mrs. Consumer need only pick the food with the specific vitamin and see for herself, or money back guaranteed. Literally truthful statements about vitamins were put together in such ways as to disarm and deceive.

Is it any wonder that the advertising of proprietary vitamin preparations drove people to inquire of their physicians, who advised them to use unadvertised products of similar composition? Today this business is almost entirely in the hands of the so-called ethical houses.

Place of Grocery Store

Another aspect in which food advertising has fallen down, in my opinion, is in its failure to identify dietary quantities of vitamins with the grocery store —rather than the drug store. Granted that vitamin supplements were novel as food items, they nevertheless *are* foods when the potencies do not materially exceed normal dietary requirements and they are used for nutritional rather than therapeutic purposes.

Failure to grasp this opportunity has lost to the grocery stores an annual business running into many millions of dollars. To those who would protest that capsules can not be sold in grocery stores, I need only point to the color and flavor capsules so marketed, and to the fact that other, more conventional ways of preparing vitamin supplements were and are available.

Applying Research

What applications of vitamin research will be made in the food industry in the near future? Any consideration of this subject must recognize two consequences of present trends:

(1) Optimum nutritional improvement or fortification of foods should, theoretically at least, result in the correction of all deficiencies of the diet, and hence eliminate the need for vitamin supplementation, except in special cases; (2) successful sensational exploitation of vitamins in foods is probably a thing of the past. In spite of the diminishing probability of immediate gain from such exploitation, it nevertheless behooves food manufacturers and producers voluntarily to produce the best possible nutriments. Otherwise they can expect to have mandatory standards imposed upon them from outside the industry.

It seems incongruous for interest in vitamin enrichment of human foods to be on the wane while the use of added vitamins in animal feeds is increasing—for of the two methods of bringing more vitamins into the human diet, the latter is physiologically less sound. Hence an expanding program of vitamin enrichment on a reasonable nutritional basis would seem to me to be desirable. Such foods as fruit juices, fruit gelatin desserts, beverages and confections should receive more attention.

Data Needed

More and better data are needed on the distribution of and requirement for those vitamins for which minimum daily requirements have not been established by the Food & Drug Administration. An effort in the direction of assembling analytical data is being sponsored by the National Research Council, and it should be watched closely by the food industry with a view toward possible practical utility.

Studies on the physiological availability of vitamins in various foods, particularly as influenced by cooking, are highly desirable, since they would shed light on whether published tables of vitamin content of foods accurately reflect the nutrition we get out of them.

Continued efforts should be made to improve analytical methods from the standpoint not only of precision but of accuracy in estimating physiological activity. The determination of the vitamin A activity of foods containing both preformed vitamin A and mixtures of carotenoids, is in a highly unsatisfactory state. Likewise with respect to some of the vitamins present in combined forms which must be hydrolyzed prior to analysis by methods that may not truly represent what happens *in vivo*.

New Vitamins

New vitamins are in the offing, although they do not at this stage seem to be of major significance in human nutrition. In fact their present history suggests that great difficulty may be encountered in convincing customers with epicurean tendencies of their dietary essentiality. One, for example, is the cow manure factor. Another is the cellulose factor present in sawdust, according to a recent report.

Another development is the guinea pig antistiffness factor. It has been crystallized from cane sugar, but nothing is known as yet of its role in human nutrition. Interestingly enough, the in-

(*Continued on page* 218)

A SPECIAL FOOD INDUSTRIES REPORT ON . . .

WEIGHT CONTROL

Basic Measurement in Industry

By DOUGLAS M. CONSIDINE
Process Engineer
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Although the principles used in weighing have not changed greatly over the centuries, scale engineers have taken full advantage of advancements in electronics, mechanical design, conveying and handling methods, and automatic control. They have developed fast, accurate methods of automatically printing weight records, and have incorporated graphic and printed type recording mechanisms which are invaluable to the plant accounting department.

ALWAYS of importance in the food industries, precision weighing today is vital among the 36 branches of the field. Yet while much progress has been achieved with the use of the latest weight control methods, there is still decided room for improvement, since all branches are not abreast in their weight technology.

Notably in the forefront are such industries as dairy and meat packing, where careful attention has been paid to the most modern control. The other branches may be ranged behind these two, back to the canning and fishing fields, where admittedly there is need for more thorough consideration of weight handling values.

Properly applied in food processing plants, scales directly or indirectly decrease cost, increase production and improve product quality. They perform primary functions in the following categories:

1. Receiving.
2. Interdepartmental transfers.
3. Blending and processing.
4. Packaging.
5. Shipping.

Scales afford the logical means to measure the flow of materials to, through, and from a plant. Because of the batch character of many food processing operations weigh tanks are often used to measure liquid materials.

Weight Figures Essential

Cost control and accounting departments are responsible to management for keeping costs down and for making sure that full value is received for all expenditures, including those for materials, labor and a host of overhead factors. But these efforts are ineffective unless analyses and recommendations are based on accurate data. Much of the required information is obtained through weighing.

* Author of *Industrial Weighing*, Reinhold Publishing Corp., 1948

Receipts Provide Starting Point in Plant Accounting System

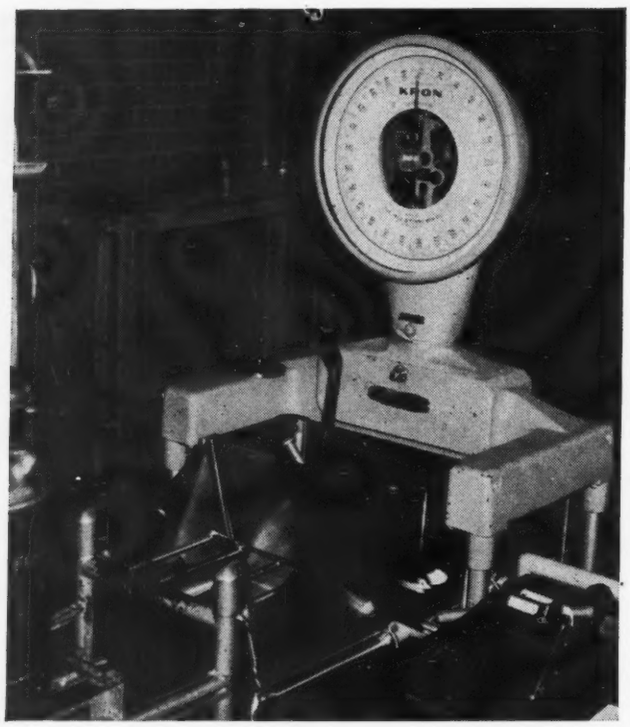


FIG. 1. WEIGH TANK type milk scale speeds handling at receiving stations. Further speed may be gained by a printing scale.

FIG. 2. AUTOMATIC DIAL type scales are well suited for weighing livestock when received at local yards.

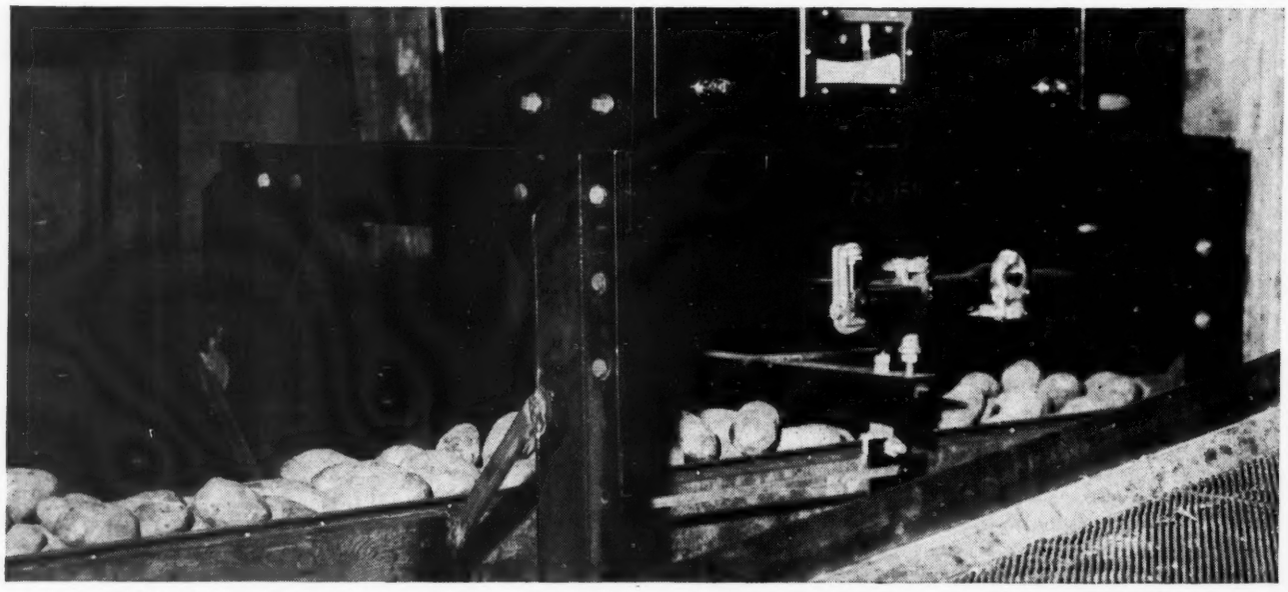


FIG. 3. CONTINUOUS CONVEYOR scales can be employed advantageously in receiving stocks of fresh fruits, vegetables and fish.

Types, Capacities, Graduations and Accuracies of Conventional Food Industry Scales

Type Scale	Upper Weighing Limit (Lb.)	Minimum Graduations*	Accuracy (Average)**
Equal-arm	up to 5	1/64 oz.	1/64 oz.
Fan	50	1/8 oz.	1/5 of 1% of cap'y.
Cylinder	70	1/8 oz.	" " "
Hanging	150	1/4 oz.	" " "
Bench dial	200	1 oz.	1/10 of 1% of cap'y.
Portable platform	1,600	1 oz.	" " " "
Floor	6,500	8 oz.	" " " "
Overhead track	12,500	8 oz.	" " " "
Built-in	21,500	1 lb.	" " " "
Suspension hopper	26,000	2 lb.	" " " "
Truck	50,000	5 lb.	" " " "
Truck-and-trailer	100,000	10 lb.	" " " "
Railroad track	335,000	20 lb.	" " " "

*The minimum graduations apply to scales having capacities equal to upper weighing limits shown. Scales with lesser capacities will logically have smaller minimum graduations. Generally, scales are graduated in 1,000 parts.

**Accuracy statements shown apply to new and well-maintained scales.

Weighing raw materials as received provides the basis for paying the vendor. It also provides the starting point in the plant materials and cost accounting system.

Receiving scales vary from small equal-arm or fan scales, with capacities as low as 5 lb., used for weighing spices and equally costly materials, to truck scales with capacities up to 50 tons, used for weighing entire truckloads. Between these extremes lie the portable platform, bench, floor and built-in types of scales.

Comparatively few railroad track scales are used in the food industry

because it requires a very large operation to warrant the cost of such an installation. Many food raw materials are not adapted to bulk handling.

The table accompanying this article lists some of the conventional types of scales suitable for receiving materials in food plants. These scales are also used for other weighing operations in such plants. In addition to these, many scales have been designed specifically for receiving and other operations.

Milk an Example

Milk receiving is an excellent example of how important the selection of a scale can be. The dairy operator must determine if the greater initial investment in a specially designed milk intake scale, as compared with the much less costly, standard platform type scale, will be returned within a reasonable time as a result of operating advantages.

A portable platform scale is usually confined to the small dairy, since individual weighing of milk cans does not lend itself to an efficient and rapid handling system. The portable scale introduces at least one extra handling operation—weighing and sampling being carried out before the milk is placed in the dump tank.

Where platform scales are used, roller conveyor systems can be installed to facilitate and speed handling. By cutting out a section of the roller conveyor and mounting it upon the scale platform, the cans may be rolled directly to the scale platform before weighing, and conveniently rolled away after weighing. The scale can easily be adjusted to compensate for the weight of the conveyor section.

Weigh Tanks

Dairy operators using portable scales should consider the number of weighings per day that can be eliminated by installing a tank scale. For example, in weighing 600 10-gal. cans on a platform scale, 600 individual weighings are required. If the average number of cans delivered per producer is 6, the total weighings can be reduced to 100 by employing a tank scale.

Fig. 1 illustrates a typical tank type milk intake scale. Such scales usually range in capacity from 500 to 1,000 lb. The scale comprises an enclosed overhead suspension lever system, from which the weigh tank, usually of stainless steel, is suspended. The levers are enclosed to reduce the possibilities of corrosion. In the usual design, the weigh tank is a single compartment, equipped with a large, quick opening dump valve. The bottom of the weigh tank is pitched toward the dump valve and the milk drains out in less than 10 sec.

In large installations, air- or electrically-operated dump valves are frequently used. The lever system is connected to an indicating dial, rigidly mounted on a circular flange fixed to the lever housing. The indicating dial is usually at eye-level and can face in any direction to facilitate convenient reading. These scales are often equipped with automatic printing mechanisms, which provide duplicate certified printed records for producers and processor alike.

Many of the considerations required in the design, selection, and operation of milk receiving scales apply to receiving operations in other branches of the food industry, especially where liquids are handled.

Receiving Livestock

To facilitate receiving at the stockyard, livestock are weighed in truck- or car-load lots. Where cattle are received at a local yard, and purchased by a broker for reshipment to another yard or to a packing plant, accurate records of the broker's weights must be compared with the weights at the ultimate destination. In this way, shrinkage losses during shipment are determined. Weights prior to shipment, are also required as a basis for payment to the railroad or trucker for transportation costs.

These Are Significant New Developments

- **Automatically controlled and integrated batching systems.**
- **Weight proportioning of two or more solid, or solid and liquid ingredients, continuously.**
- **Automatic carton checking.**
- **Printing and recording of weight records.**

Establishment of accurate receiving weights at the packing plant is important. For it is only with such live weights that the packer can accurately determine the yield he is obtaining.

The livestock scale, illustrated in Fig. 2, is constructed along the lines of a built-in floor scale or truck scale. It is a wooden or metal pen, built on a standard scale platform. Capacities range up to 30 tons, with platform sizes as large as 10 x 30 ft. Automatic dial indicating scales are ideally suited to this application.

Handling Grain

The farmer seldom sells large quantities of grain directly to the processor or ultimate consumer. The transaction is usually with the operator of a country elevator. Since the farmer brings grain to the elevator in trucks or wagons, each elevator is equipped with a truck scale. The farmer is paid for his grain on the basis of the weights determined by this scale.

Automatic printing type truck scales for weighing and buying grain offer many advantages: The farmer receives an accurate, neatly printed record of the weight of grain delivered, and the elevator operator has duplicate or even triplicate records of the transaction upon which to base his accounting.

Weighing is again important in shipping grain from the elevator. It is common practice to install an automatic-hopper scale in the cupola of the elevator so that grain will drop directly to the car with little chance of diversion or loss. Scales for this purpose have capacities of from 360 to 600 lb. per draft. They are usually equipped with a totalizing counter and ticket printer. A double interlock between the scale feed gate and discharge door prevents grain passing through the scale unweighed. These scales are not limited to the handling of grain, but can be used for almost any free flowing material.

Conveyor Scales

In some food plants, it is desirable to weigh materials continuously on a conveyor belt. A scale for this purpose is illustrated in Fig. 3. One or more of the rollers supporting the belt conveyor is suspended from the scale lever system. The scale pointer continuously indicates the load on the belt, while an electrical integrator totalizes the flow of material passing over the belt. Changes in belt speed are automatically compensated. These scales form an integral part of a materials handling system, require comparatively little space and in no way slow the conveying operation.

The receiving of many fresh vegetables and fruits in canning and preserving plants and of fish at coastal piers are examples of operations that probably can be improved immeasurably through application of continuous conveyor type weighers.

Interdepartmental Transfers

Meat packing plants are generally operated on a departmental basis. Killing, cutting, curing and other operations are carried out by separate departments and are so recorded in the company's books. It is necessary to determine the exact amount of material entering each department so that one department can be properly accredited with the material transferred, and the department receiving the material can be properly charged. Such a scale for interdepartmental weighing is illustrated in Fig. 4.

Inter-departmental weighing is considered of such importance that, in

Interdepartmental Transfers Must Be Accurately Made

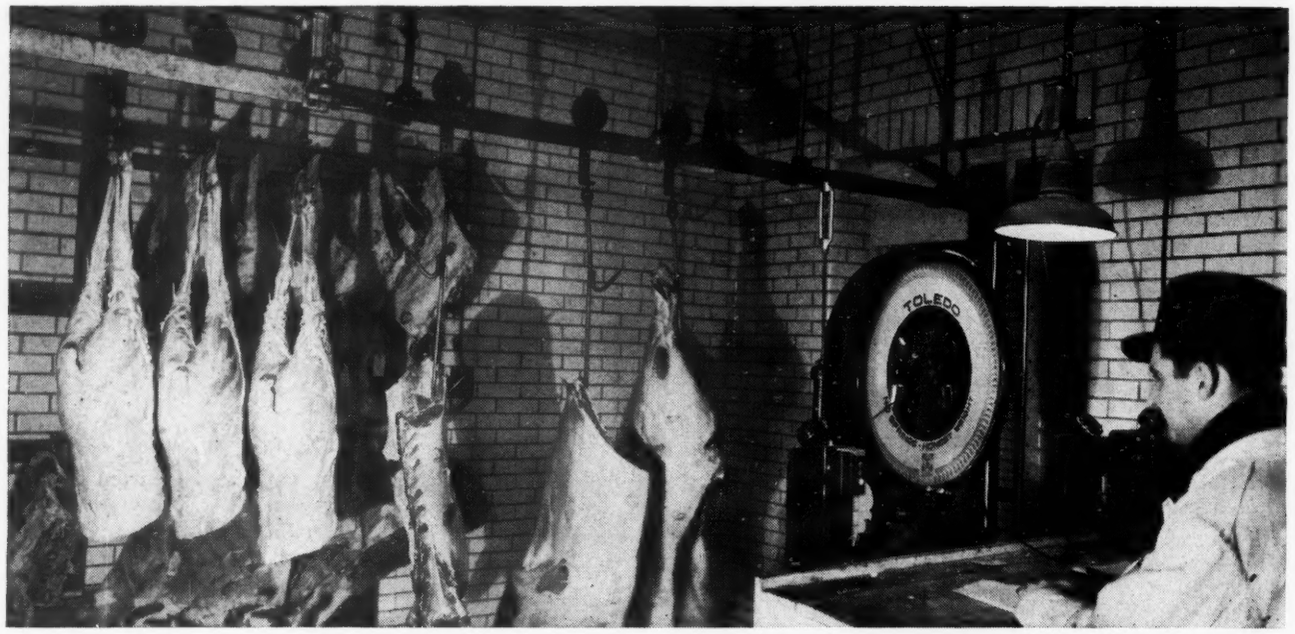


FIG. 4. OVERHEAD TRACK scale introduces but little delay in progress of meat between departments in a packing house since it is not necessary to stop the conveyor lines each time a weighing is made. These weights facilitate departmental accounting.

some plants, two independent scales are located side by side where such weighings are made. Separate and distinct records are maintained of all weighings made over these scales. Any variations in the records indicates either carelessness on the part of the weighmen or need for repair of the weighing equipment. Printing scales are effective at these points in that they speed the weighing operations and provide uniform legible records.

Weight Packaging

Two reasons for accurate weighing in the final packaging of a food product, are: (1) Assurance that the package contains the correct net weight, and (2) preservation of packaging profits. To insure customer goodwill and confidence and to meet legal requirements, net weights must be right.

A point sometimes overlooked, however, is the ever-present possibility of losing money through placing too much profits. To insure customer goodwill tional overweight in an individual package may be small, but when multiplied by hundreds or thousands of packages per day, it can spell the difference between profit and loss. Packaging operations should be under the constant vigil of management. Whenever costs rise unexpectedly, packaging should be one of the first operations checked.

Next to accuracy, speed is the major requirement in equipment for bagging, filling and packaging. Numerous weighing arrangements have been developed to meet these requirements.

Filling the final food package is accomplished in several ways: (1) An operator may manually weigh out the material into the container or package; (2) a volumetric filler, with or without a weighing attachment may be used; or (3) a weigh packer which automatically fills the package to a definite weight may be used. Whatever the arrangement, unless the product is sold by volume or by count, a scale must be employed somewhere in the final packaging operation.

Some products are not easily adapted to mechanical handling and hence automatic weighing and packaging are not practical.

Meat products, for example, because of their general lack of uniformity in size and because of their poor handling qualities, require manual weighing. The equal-arm net weight packing scale is widely used for such operations.

Fig. 5 shows a battery of net-weight packing scales used to weigh sliced bacon. The bacon is sliced on an automatic cutter, which places one slice on another in a steplike fashion. As the bacon emerges from the cutter, an operator places a number of slices, that will give approximately the package weight desired, on a sheet of waxed paper. Final weighing and packaging is performed by a group of operators located on either side of the conveyor.

Accurate, low capacity, net-weight packing scales are used for this final weighing operation. Each operator places the previously stacked slices on the scale and obtains final balance by adding or subtracting part of a slice. The package is then returned to the conveyor. At the end of the conveyor another operator places a given number of packages in a cardboard container which is check-weighed on a bench-dial scale.

Net-weight packing scales not only indicate a condition of balance, but also indicate, within limits, the deviation of the load over or under the balance point. With this over-under type of indication, it is possible to determine almost instantly the deviation from the desired weight and whether it is within permissible limits. Scales of this type are frequently called "predetermined weight" scales.

Bringing the scale to exact balance by manually adjusting the beam and adding or subtracting loose fractional weights, would be slow—each weighing would require manual adjustment. Since the graduations on the chart of a net weight scale cover only a small portion of the total capacity, full advantage of the inherent sensitivity of the scale is taken.

Check-Weighing

Predetermined weight scales are widely used for checking purposes. Butter prints, for example, are formed in special machines on a volumetric basis. To assure correct final weights frequent checking is necessary. In Fig. 8, a predetermined weight scale is used to check one package out of every 10 or 100 produced, as determined by the past performance of the forming machine. Check-weighing is very important, of course, in adjusting the cutting or forming machine at the start of a run. One type of net-weight scale is shown in Fig 7.

Fig. 6 illustrates another example of check-weighing after a volumetric fill-

Check-Weighing is Necessary in the Packaging of Some Products

FIG. 5. IN PACKAGING sliced bacon, the final weighing is performed on equal-arm predetermined weight scales.

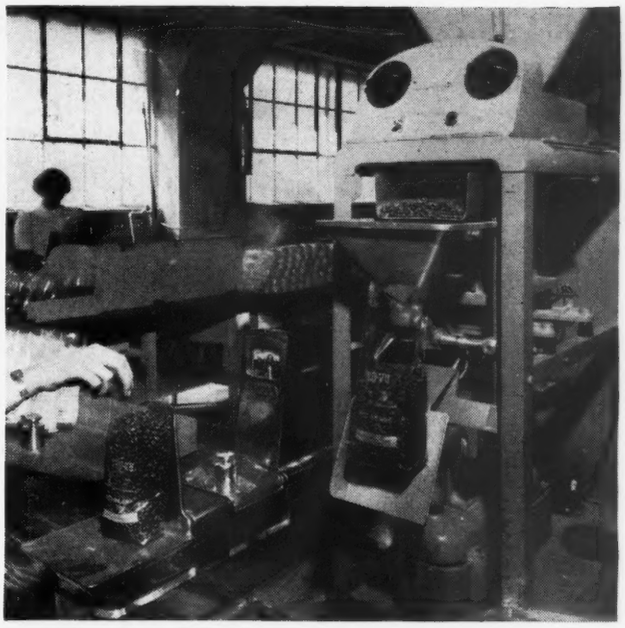


FIG. 6. AFTER BEING volumetrically filled into bags, beans are check-weighed on predetermined weight scale.

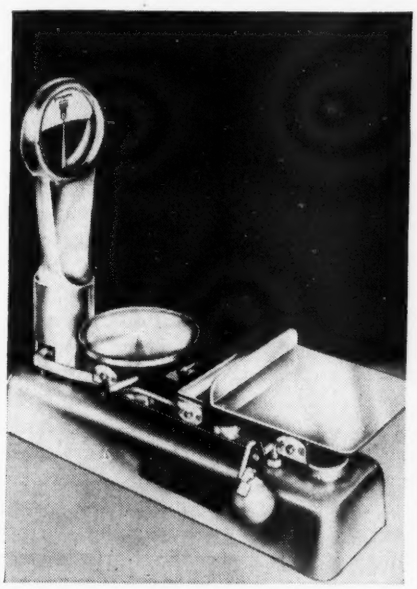


FIG. 7. NET-WEIGHT packing scale indicates deviations from the desired weight.

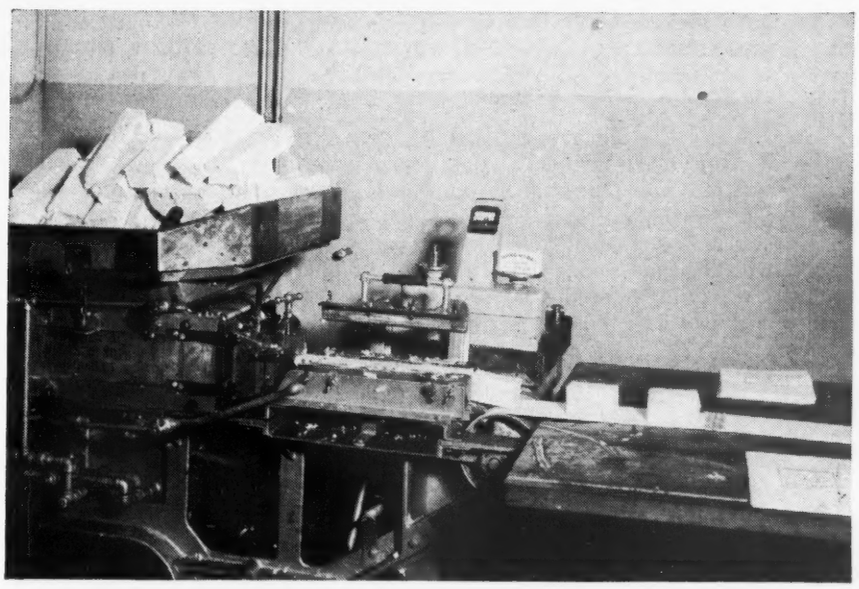


FIG. 8. PREDETERMINED weight scale is used to check weigh of volumetrically formed pound prints of butter. This operation is especially important at beginning of run.

ing operation where beans are being packaged. The scale is adjusted for the desired weight and, if the final package does not come within the tolerances, adjustments of the filling machine must be made.

Automatic Weigh Packers

For large volume production, speed in packaging is of the utmost importance. Where the handling characteristics of the product permit automatic weigh packers, these machines are a good investment. They reduce the human factor to a minimum.

The wide variety of designs for automatic weigh packers makes a clear-cut classification difficult. Some of the major variations include:

1. Single-unit weigh packers, in which only one container is filled at a time.

2. Multiple-unit weigh packers, in which two or more containers are filled simultaneously.

3. Semi-automatic weigh packers, in which the container must be placed into filling position and removed by hand.

4. Completely automatic weigh packers, in which the containers enter and leave the filling and weighing machine automatically.

5. Semi-continuous weigh packers, which require an operator to initiate each discharge of the scale by pulling a chain, pushing a button or the equivalent.

6. Continuous weigh packers, in which material is weighed in continuous drafts, there being a definite time interval between each two weighings for the operator to remove the filled container and replace it with an empty container.

7. Volumetric fillers and weight checkers, in which the container is filled by volume and checked by weight.

Fig. 9 shows a single unit, semi-automatic weigh packer of the continuous type. A scale of this type is suitable for accurate weigh-packing of any free flowing food product. Since manual operations are required to place the

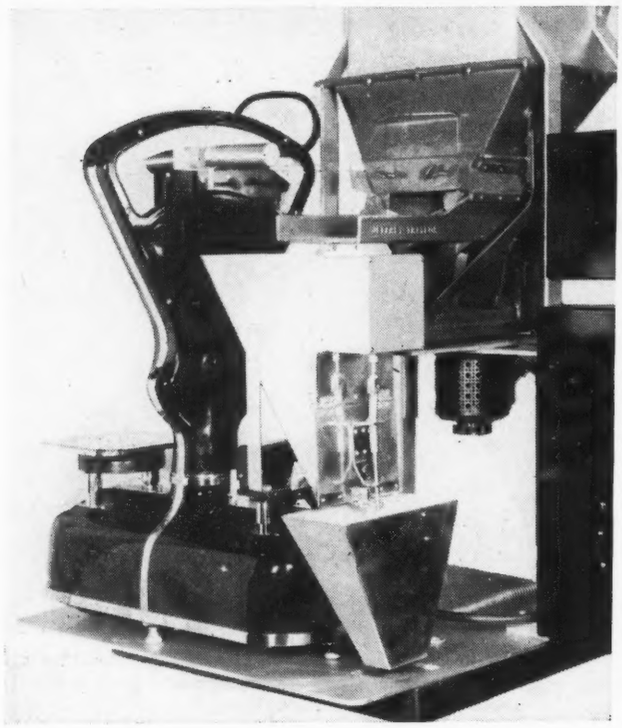


FIG. 9. SEMI-AUTOMATIC, single unit weigh packer needs operator to insert container spout and remove filled one.

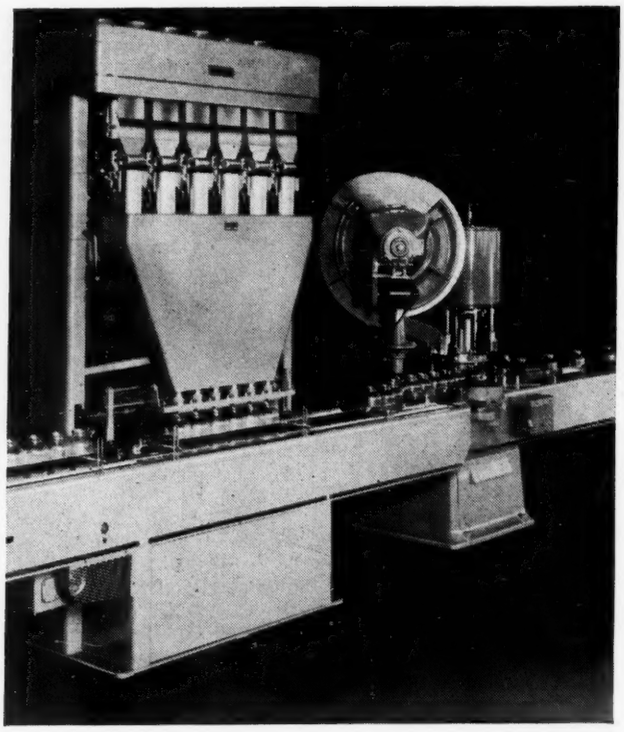


FIG. 10. MULTIPLE-UNIT weigh packer automatically operates six weigh hoppers and discharge spouts in filling coffee jars.

container under the filling spout and to remove the filled container, this arrangement is not the ultimate in high speed packing operations. It is much faster, however, than completely manual weighing and serves the needs of plants where high speed mass production methods have not yet proved economical.

This scale has an electric vibratory feeder, a fan type predetermined weight scale equipped with photoelectric cut-off, and necessary relays and electric components for adjusting rate of feed and operation of the equipment.

Vibratory Feeders

A vibratory feeder comprises: (1) A vibrating trough or deck, over which the material flows; (2) a vibrating motor, usually a pulsating electro-magnet which supplies the vibratory energy; and (3) vibrator bars or springs to supply the required restoring force.

Material flows over the deck as a result of controlled vibrations, which vary in amplitude from 1/32 to 1/8 in. and from 1,800 to 7,200 cycles per second. Since the vibrations are stopped when the power to the electromagnet is shut off and, since the flow of material stops when the vibrations cease, precise cut-off of feed can be accomplished without difficulty.

In the arrangement shown in Fig. 9, an interceptor is incorporated on, and revolves with, the indicating pointer. A photoelectric cell is mounted on the scale head so that the light-sensitive portion directly faces a section of the scale chart. When the interceptor passes between this section of the chart and the photoelectric cell, an electric contact is made or broken, as required by the operation. The position of the interceptor is adjusted so that cut-off will take place at the exact weight value desired.

A multiple unit weigh-packer for weighing coffee into jars is illustrated in Fig. 10. This scale operates six separate weigh hoppers and discharge spouts. The unit is fully automatic and continuous, requiring no manual positioning of containers under the scale spouts. Completely automatic operation is effected by precise coordination of the conveyor action with that of the scale. The machine is capable of delivering ½, 1, and 2-lb. discharges into cartons, jars or tins. It has a capacity of 60 containers per min. with very close weight tolerances. The conveyor carries a vibrating settler to insure proper packing of the material.

Weighing Into Bags

Bagging scales are used for weighing sugar, coffee beans, cocoa beans, rice, feedstuffs, food by-products and the like. Where high speed mass production is not a factor, manual weighing, using a portable platform scale (as illustrated in Fig. 11), may suffice.

As in the cases of the smaller packing operations previously described, a predetermined weight type scale, available not only in the equal-arm type, but also in fan, bench-dial, and portable platform scales, is recommended. With this type of scale, the operator need concentrate his vision on only that portion of the dial which shows the weight desired.

For high speed operations, an automatic bagging scale of the type depicted in Fig. 12 is used. This scale weighs 325-lb. of raw sugar into bags at a rate of from three to four bags per minute. Scales of this type are often equipped with oscillating units on which the bags rest during the filling operation. Thorough packing during filling is thus assured and overflowing of material from the bag is prevented.

Packing Meats for Shipment

In preparing meats and meat products for local delivery or shipment, a large variety of types and sizes of containers is involved. Most large and small meat cuts are packed in cases; bulk goods, such as sausage, in cartons and cases; lard in cans, rolls, and bricks; sliced bacon in cartons and cases; and potted, boiled and pickled meats in barrels, cans and jars. Packing operations thus require a broad selection of scales—in types, capacities and platform sizes.

The bench-dial scale fills many of these requirements. Fig. 13 shows a battery of these scales installed in the final packing room of a large plant. This view illustrates clearly the installation of a section of roller con-

Bag Weighing May be Performed Manually or Automatically

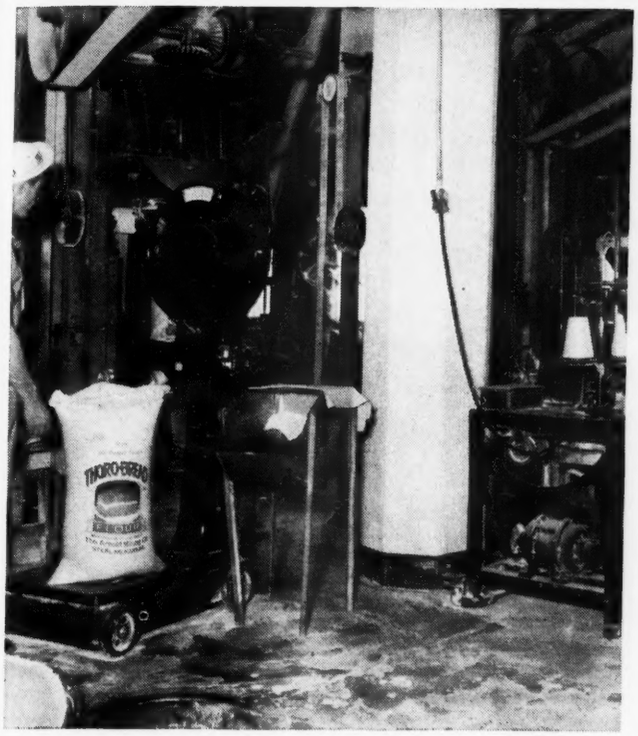


FIG. 11. BULK MATERIALS are manually weighed into bags. Portable platform predetermined weight scales are used.

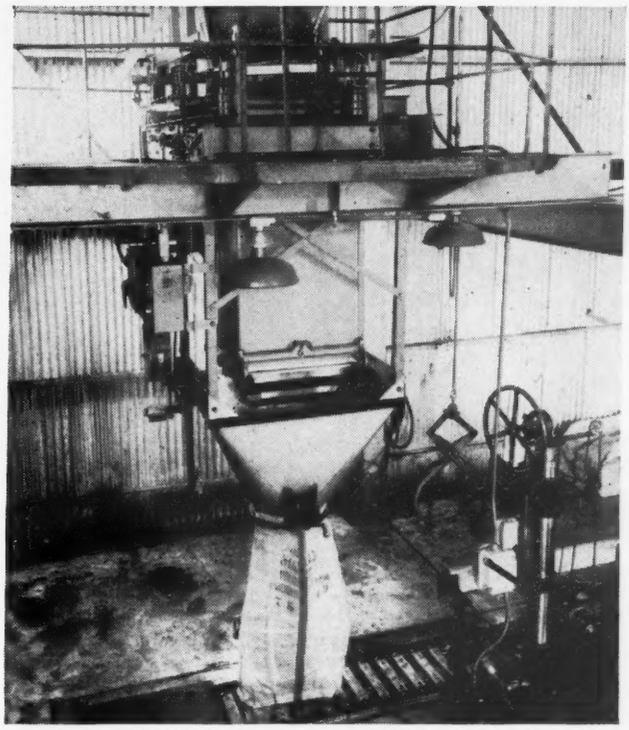


FIG. 12. AUTOMATIC BAGGING scale fills 3 to 4 325-lb. bags of sugar per min. Filled bags are conveyed to sewing machine.

veyor on a bench-dial scale. With this arrangement, a minimum of delay in the conveying operation is experienced.

Weighing for Control Purposes

So far in this article, applications of scales to various operations related intimately to the food plant accounting system have been described. As will be evident from the following section, weighing equipment is of equal value to process and product control.

In the manufacture of ice cream, air is incorporated into the mix during freezing. The degree of air incorporation affects the texture and other properties of the ice cream. Many states have legal requirements which fix the gain in volume to a given percentage of the original volume of the same mix before freezing. This gain in volume is usually referred to as overrun. Each manufacturer knows from experience what this increase in volume should be and, with this knowledge, can vary the overrun of a given mix to produce ice creams of the desired textures.

Overrun can be determined by means of an ice cream volume scale of the type shown in Fig. 14. This is a low-capacity, fan-type scale, with special chart and weighing cup of exactly one-pint capacity. The scale chart provides the following information:

1. Actual weight of one pint of mix.
2. Actual weight of one gallon of mix.
3. Actual weight of one pint of ice cream.
4. Increase in volume of ice cream over mix.

In operation, the one-pint cup is filled with unfrozen mix. The sides of the cup are wiped dry to prevent error. With the cup on the scale, the indicator comes to rest at or near 1.00 at the right of one of the concentric lines. The figure on the indicator nearest this 1.00 indicates the weight per gallon of the mix.

During the freezing process, tests are made to determine the increase in volume. If the weight per gallon of mix is 9.2 lb. and an increase in volume of ice cream over mix of 2 to 1 is desired, the freezer operation is continued until samples indicate 2.00 on the concentric line adjacent to 9.2 on the indicator.

Small variations in the proportions of spices, flavoring extracts, edible fats and salts in such products as sausage, wiener stock, bologna, scrapple and similar meats have a pronounced effect upon their taste and acceptance by the consumer. Many of these materials are relatively expensive and an overweight spells the waste of a valuable substance.

For weighing ingredients used in small quantities, an automatic fan scale for counter use, with chart capacities of 2 and 5 lb., has found wide acceptance in the meat packing industry. Loose weights, available in several combinations, permit weighings up to 30 lb. These scales are often furnished with an open-end scoop for convenient dispensing of the ingredients.

Ham Curing by Artery Pumping

Brining of hams is based upon weight and is accomplished by placing

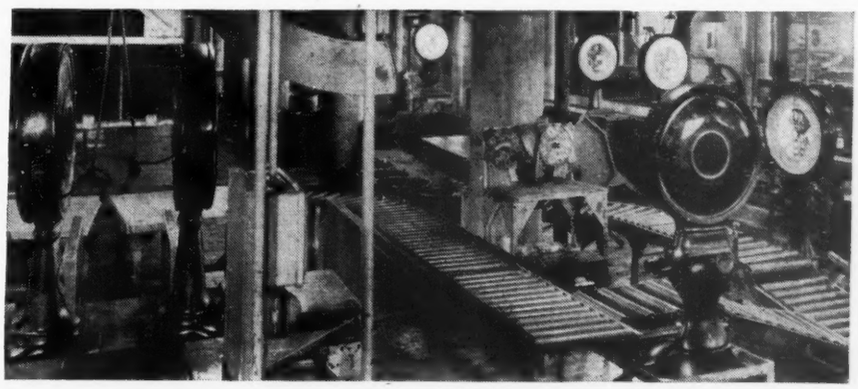


FIG. 13. BENCH DIAL scales are used to check weights of packages of finished products in meat packing plant. Sections of roller conveyor are mounted on scale platforms.

Processing Control is Provided by Specially Designed Scales

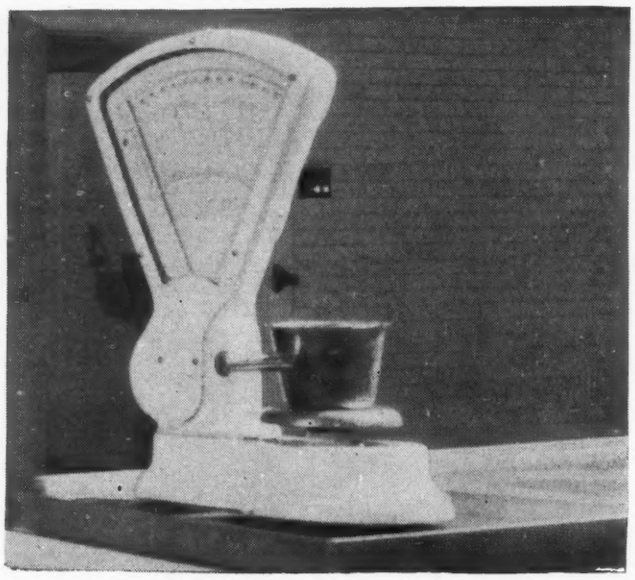


FIG. 14. OVERRUN of ice cream is determined by a low-capacity, fan-type scale having a special chart and weighing cup.

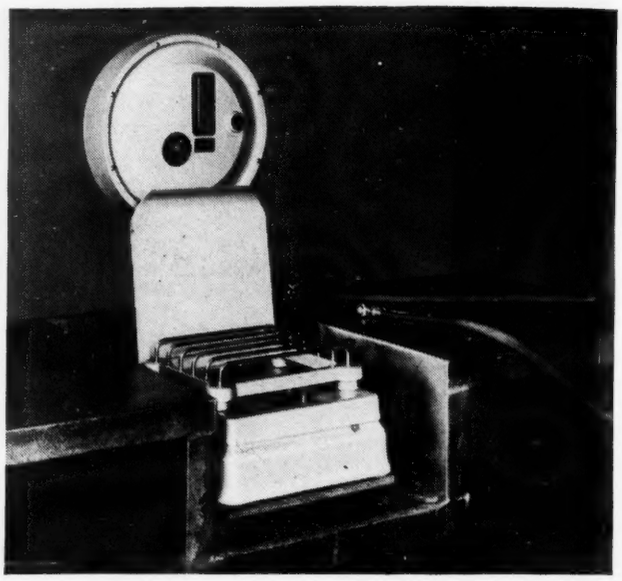


FIG. 15. ARTERY PUMPING, by accurately weigh proportioning curing brine, using this scale, gives uniform flavor to hams.

the hams in large vats of brine or by artery pumping. In the latter method the curing brine is forced into the arteries of the ham by means of a special needle. The amount of brine introduced depends upon the weight of the green ham. To insure accuracy of this operation, a specially designed artery pumping scale of the type pictured in Fig. 15, is used.

The scale is set for the correct percentage of brine, then the operator pumps the brine solution until this desired percentage is reached. This permits transfer of skill from the operator to the scale, enabling an average operator to obtain highly satisfactory results at high speed.

The scale is patterned after the standard automatic bench-dial scale. It is available with a total capacity ranging from 30 to 50 lb. with one-ounce graduations. Vital parts of the scale are constructed of stainless steel to provide protection against corrosion.

A special, round, metal chart replaces the pointer usually fastened to the indicator shaft. Evenly divided weight graduations are marked on the periphery of the chart and are magnified by a one-spot indicator. When a load is placed on the platform, the chart turns and the correct weight is observed through this indicator. In addition to weight graduations, the chart contains specially plotted arcs which are used in determining the correct percentage of brine to be added.

Operation of the scale is as follows:

1. Percentage adjusting knob is set at desired point.
2. Ham is placed on scale platform.
3. Percentage indicator is adjusted by means of lever at right.
4. Brine is injected until proper percentage is indicated.
5. Ham is removed from scale platform.

The percentage adjusting knob ranges from 4 to 20 percent, with ½ percent graduations. In average practice, the brine added is from 8 to 14 percent of the initial weight of the green ham.

The indicator comprises a long, narrow, vertical slot in which lines move up or down as the weight on the grid platform decreases or increases. Alongside the slot are two pointers, the spacing of which is controlled by the percentage adjusting knob—the greater the percentage, the wider this spacing.

When the line is at the top pointer, the weight of the green ham is 100 percent. As brine is pumped into the ham, the line in the indicator falls. If the percentage adjusting knob is set at 10, the correct amount of brine has been added when the line reaches the lower pointer, at which time the treated ham's weight is 110 percent that of its green weight. The two pointers are colored red for greater perceptibility and the indicator is brightly illuminated.

Determining Yields

An important part of process control and also cost accounting in the meat packing plant, is determination of yield. Although there is little material wasted in the modern packing plant the major return to the packer is derived from the salable meat remaining after the animal has been dressed. By subtracting the weight of the dressed carcass from the live weight, the yield is determined. In practice, the yield is determined for a given group of animals processed, since it would be impractical to keep track of individual animals.

Carcasses are weighed before they are placed in the chill room. Those within given weight ranges are hung in specific locations in the cooler and a report is made to the production superintendent, summarizing the number of carcasses in each weight group.

In addition to sizing and grading carcasses, these operations are important later in processing. Small cuts are graded by weight and since, in many cases, the differences between various grades are small, the scales employed must be sensitive and accurate to permit as close a division as possible. It must be stressed that the uniformity of these products and their prices are substantially determined by these weighings.

Numerous scales for sizing and grading are required in the average packing plant. The automatic bench dial-scale, mounted on an adjustable wheeled stand and equipped with special packing house pans, is well adapted to weighing cuts up to 200 lb. These scales are flexible and can be moved conveniently from one work bench to the next. The scale may be equipped with a thermostatic dash pot, which enables it to be moved in and out of chill rooms without requiring dash pot adjustments.

Heavier items, such as beef quarters, are weighed on overhead track scales (see Fig. 4). With a scale of this type, it is not necessary to stop conveyor lines each time a weighing is made. To permit weighing while the product is being conveyed, a short sec-

Automatic Weigh-Batching Systems are Used for Proportioning Ingredients

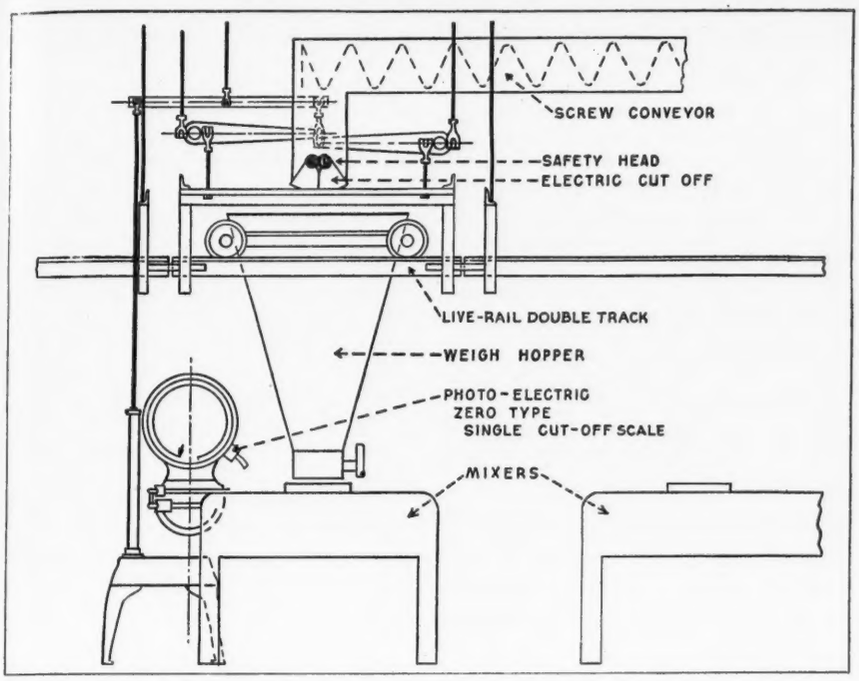


FIG. 16. AUTOMATIC WEIGH batching system used in bakeries, comprises a 4-wheel hopper carriage on a 2-rail overhead track. Weighing is done on the live-rail section of track which is connected to the overhead levers of the automatic dial scale.

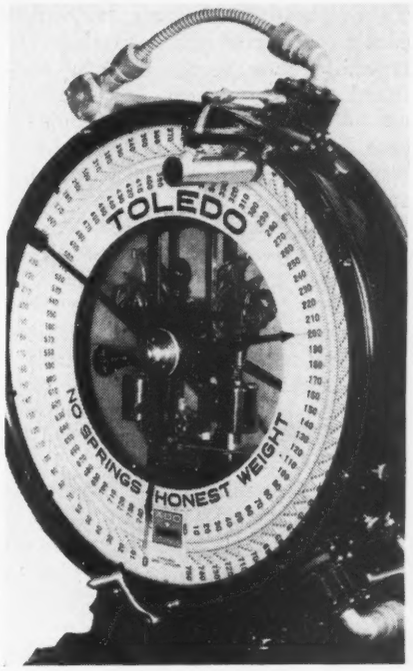


FIG. 17. DIAL scale for use in automatic weigh batching system. It is equipped with photoelectric cell and interceptor.

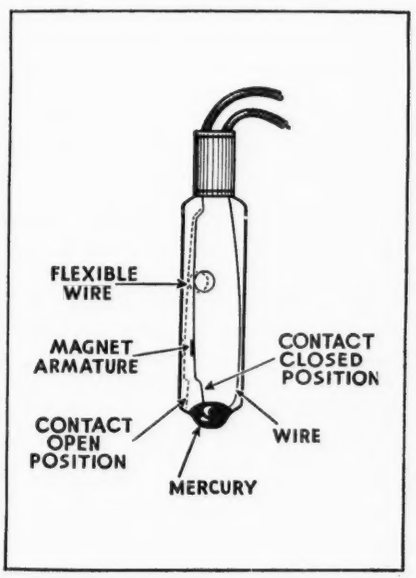


FIG. 18. HOW mercury-magnetic contact, used in dial scales of automatic batching systems, operates.

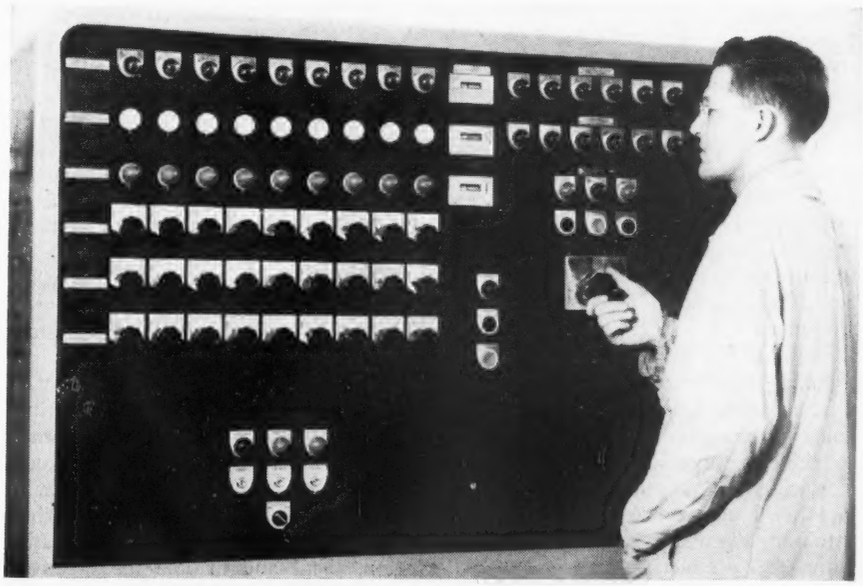


FIG. 19. A BATCHING system may be tailored to the exact needs of an application, with any number of interlocks and accessory signals as shown in this central control panel of an extensive automatic weigh batching system.

tion of the live track is formed so there is a low spot just beyond the middle portion of the track. As the supporting trolley engages the live track, the trolley rolls ahead of the conveyor drive chain, coming to rest at the low point. A reading is taken immediately—just before the conveyor lug again engages the trolley and pushes it from the section of live track.

Once the yield has been determined, the carcasses are placed in a chill room. Even with closely controlled temperatures and humidities, a certain amount of shrinkage occurs. For direct measurement of shrinkage, the carcasses are weighed as they enter and as they leave the cooler. These weights also provide the basis for transferring the carcasses to the cutting departments. Shrinkage of meat products also occurs in smoke rooms and can be checked through weight control.

Weighing in Bakeries

In batching dough, any inaccuracies in weighing adversely affect the uniformity and quality of the final product. Weighing errors at this point may not be detected until final product tests are made—too late to save a long line of production from the oven. Such errors waste materials, labor and power, and upset production schedules.

Sifted flour is usually weighed in an automatic hopper scale. In large bakeries, the weigh-hopper is frequently mounted on a four-wheel carriage allowing use of a single piece of equipment for several mixers. The scale is designed to provide automatic weight proportioning of flour to the mixer, practically eliminating human error (see Fig. 22).

The installation depicted diagrammatically in Fig. 16 comprises a two-rail overhead track scale on which rides a four-wheel hopper carriage. A live-rail section of the track is connected to the overhead levers of an automatic dial scale. All weighing is done on this live-rail section. After weighing, the load is discharged to a waiting mixer.

Flour is brought to a point directly over the live-rail section and fed to the hopper through a small chute at the end of the conveyor. The flow from the chute is regulated by opening or closing a clamshell gate, controlled by an electric cut-off in the scale proper. Scales of this type are equipped with a 1,000-lb. dial, graduated in 1-lb. units.

From the mixer, the dough is placed in fermenting troughs, which in turn are placed in conditioning rooms where the dough rises. To insure against over- or under-weight, the loaf-size portions must be check-weighed. If bread is the product to be made, the dough is cut or divided automatically into the required portions for individual loaves.

Trends in Scales

No article on weight control in food processing would be complete without considering modern trends in weighing equipment design and application. Some of the most significant new developments are: (1) Completely integrated and automatically controlled batching systems; (2) continuously proportioning by weight of two or more solid ingredients, or solid and liquid ingredients; (3) automatic carton checking in final packing operations; and (4) automatic printing and graphic recording of weight records.

The author believes that food technologists can gain much by thoroughly considering many of the above technics which have been highly developed in other industries, especially in glass batching, chemical process control and alloy steel production.

Automatic Batching

Systems used in proportioning ingredients for specialty flours, such as are used in prepared biscuit and doughnut mixes, usually comprise: (a) Two or more suspended hopper scales, depending upon the number of individual ingredients involved; (b) electric vibratory feeders for charging each weigh hopper, and similar feeders for discharging each hopper; and (c) electric contacts in the scale dial housing, of either the photoelectric or mercury magnetic type.

A dial scale equipped with a photoelectric cut-off is illustrated in Fig. 17. As in the packing scale previously described, electric contact is made when the interceptor comes in the path of the sensitive photoelectric cell. This contact can be used to start or stop the vibratory feeders.

Where both charging and discharging of the scale hoppers is controlled automatically, the scale is equipped with two interceptors. With extremely free flowing materials and where very precise cut-off is required, the scale can be equipped with a special interceptor and relay which permits full feed for about 80 percent of the flow, then a dribble for the last 20 percent.

Vacuum Tube Used

Mercury-magnetic cut-offs are also used in dial scales to accomplish the same results. In this arrangement, a mercury-magnetic contact is used (see Fig. 18). This contact comprises a small vacuum tube containing a drop of mercury and a flexible wire, the end of which contacts the mercury in the closed position. A magnetic armature is mounted on the flexible wire. When subjected to magnetic attraction, this armature draws the wire out of the mercury causing the electric contact to be broken.

The contact tube is mounted on an adjustable bracket located at the lower section of the dial housing opposite the zero dial position. It is very close to the plane of dial indicator travel. A small permanent magnet is attached to the scale indicator by an arm. When the indicator is in the zero dial position, the magnet attracts the armature on the flexible wire in the vacuum tube, causing the break in the circuit.

With no load on the scale, a poise on the beam is set to the desired weight. The dial indicator revolves in a clockwise direction from the zero graduation and come to rest at a position on the dial equivalent to the poise setting. The load is then applied to the scale, whereupon the indicator revolves back toward zero in a counter clockwise direction. The cut-off takes place when the indicator reaches the zero graduation. Full and dribble feeds can be effected by incorporating two cut-offs.

With the automatic control tools just described, numerous variations are possible. A batching system tailored to the exact needs of an application, with almost any number of interlocks, accessory signals, etc., can be obtained. The degree to which a batching system can be made automatic depends principally upon the economic and operating practicability of the system. The control panel of an extensive automatic batching system is seen in Fig. 19.

Continuous Proportioning

In the manufacture of any food product involving free flowing solids, proportioning by weight can be accomplished continuously through the use of weigh feeders.

The "Waytrol", illustrated in Fig. 20, is used for continuous weigh feeding and proportioning. This unit comprises: (1) A supply hopper; (2) an electric vibratory feeder; (3) an endless traveling weigh belt; (4) a calibrated scale beam with counterpoise; (5) a suitable lever system; and (6) magnetic contacts, at the end of the scale beam, which come into action when the apparatus is unbalanced. The weighing end of the feeder takes the form of a first class lever, which is connected through a lever system to the scale beam. Material is fed onto the belt at a point remote from the fulcrum, providing maximum sensitivity to the machine.

When properly adjusted and feeding at the desired rate, the scale beam is level and neither the over- or under-contact is "made." If the belt tilts down, indicating the flow of material is excessive, the over-contact at the end of the scale beam "makes." This actuates a rheostat, decreasing the amplitude of vibrations in the feeder and hence throttling the flow of material. If the belt tilts upward, indicating a deficiency in the flow of material, the under-contact makes, which increases the amplitude of vibrations, resulting in an increased flow.

Such feeders are available with capacities ranging from about 2½ lb. per hour to 10 tons per min.

Gravimetric Feeder

The Omega belt type gravimetric feeder (see Fig. 21) incorporates a vibratory feeder having a small material supply hopper with a built-in shutoff gate, a short conveyor belt suspended from a scale, a variable speed transmission drive for the belt, a counter geared to the belt drive shaft, a linkage between the scale and feeder, and electrical alarms.

Material flows from the hopper onto the vibrating feeder tray which discharges onto the weighbelt. Vibrating movement is imparted to the tray by a cam-operated oscillator through a wedge shaped rubber bumper which hangs freely from the scale beam. A vibrating movement of ⅛ in. effects maximum feed. Changes in feeding rate are obtained by adjusting the variable speed transmission.

The food industry has done little to take advantage of systems used in the chemical and petroleum fields for automatically proportioning solids and liquids. In a typical system, the liquid ingredient is measured by means of an orifice or venturi, which is connected to a differential type flow meter.

The latter instrument is equipped with a means for electrically transmitting the flow reading to a device which

Smooth Materials Flow is Provided by These Weigh Feeder Systems

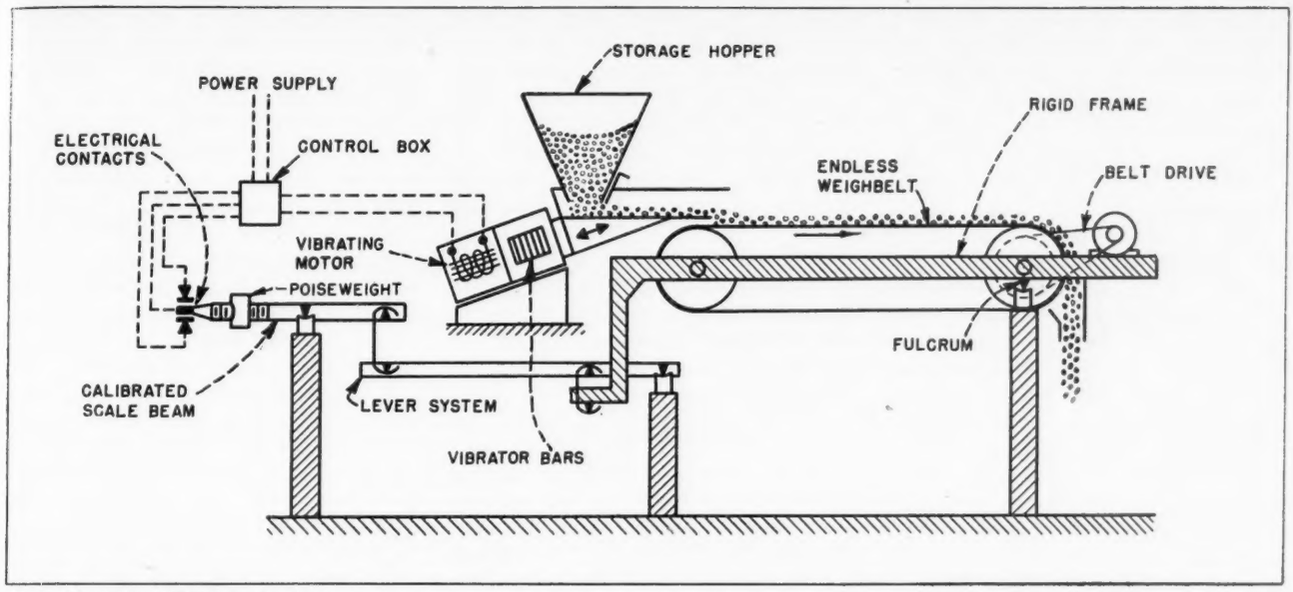


FIG. 20. JEFFREY-TRAYLOR "Waytrol" system for the continuous weigh feeding and proportioning of relatively free flowing solids.

retracts the poise on a loss-in-weight type hopper scale. The poise is retracted more rapidly or slowly to effect a feed of solid material in proportion to the flow of the liquid substance. With the manifold combinations available in automatic scales, feeders, and industrial liquid flow measuring and controlling devices, numerous systems of this type can be developed.

Automatic Carton Checking

Many food products are packed for shipment in corrugated cartons. Errors can be made in completely filling these cartons and, where glass jars or bottles are involved, breakage can occur prior to shipment. Once the carton is sealed, visual inspection cannot be used to determine omissions and often the breakage of a few glass containers may not be evident, especially if the material is solid or viscous. Even the breakage of a liquid container may not be evident where the packing material absorbs the spilled liquid.

To make certain that packed cartons leave the factory filled and unbroken, many food plants employ an automatic carton checking scale. A bench dial scale, designed to fit directly into the roller conveyor system, is generally used for this purpose. It is equipped with electrical contacts so that light cartons will be automatically ejected. The scales often incorporate a warning signal light or buzzer.

Selecting Scales

In selecting a scale, it is first necessary to determine the capacity, size, and style best suited for the job. Once these factors are established, the field of available scales should be judged from the standpoint of excellence in design and construction. The rates

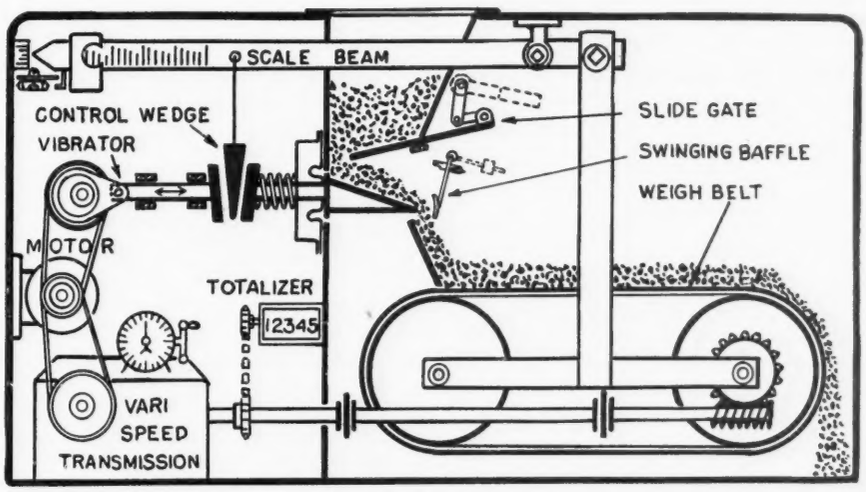


FIG. 21. OMEGA belt type gravimetric feeder incorporates vibrating feeder tray.

of depreciation and obsolescence of scales are usually less than those for most other items of process equipment. Scale selection should therefore not be made on a basis of small difference in first cost.

Capacity. Automatic dial scales are generally graduated from zero to the total dial capacity, in 1,000 graduations, or approximately that number, depending upon the most convenient subdivisions to use for the range involved. For example, a scale with a dial capacity of 1,000 lb. will have 1-lb. graduations. At full capacity, this scale will weigh to one part in one-thousand parts, although the scale actually can be read accurately to the half-graduation.

It is important to note that maximum accuracy, percentagewise, is obtained at the top of the dial capacity. A 1,000 lb. load on a 1,000 lb. capacity scale will be weighed with an accuracy of 1 part in 1,000. An 800-lb. load on the same scale will be weighed with an accuracy of 1 part in 800. No matter what the load, the scale will weigh to the closest pound or, by reading half graduations, to the closest $\frac{1}{2}$ lb. Obviously, then, for a load of 400 lb., a 1,000 lb. capacity scale will not provide the accuracy afforded by a scale with a 500-lb. capacity. On a 1,000-lb. capacity scale, a 400 lb. load will be weighed to 1 part in 400, while on a 500 lb. capacity scale, the load will be weighed to 1 part in 800. Thus, it is seen that the capacity of a scale should be selected with reference to the average load to be weighed on it.

Where a variety of items is to be weighed, some thought should be given to whether one scale will do the job. The items to be weighed during an average day should be tabulated and analyzed, and a decision made based on these data.

Size. When selecting the platform size of floor, "built-in," truck or rail-

road track scales, the following factors should be considered: (1) What is the base size of the average container or vehicle to be weighed?; (2) what is the base size of the largest container or vehicle to be weighed?; (3) how many containers will be weighed at any one time?; and (4) what floor space is conveniently available for installation of the scale?

Style. Following are some of the considerations in selecting the style of a scale: (1) If a streamlined accounting system is desired, specify a printing scale; (2) if the scale dial is to be read from a considerable distance, specify a large illuminated dial; (3) if it will be convenient to read the scale dial from either of two directions, front and back, specify double indication; (4) if a permanent record of weighings is required, specify graphic recording; (5) if materials must be weighed continuously, specify (a) Totalizing conveyor scale, and (b) an automatic hopper scale; and (6) if a totalizing conveyor scale or automatic hopper scale is desired, specify totalizing counters, so that maximum usage of the scale as an accounting machine will be obtained.

Location

Importance of proper installation in scale operation cannot be overemphasized. A mediocre scale, properly installed and maintained, will give better results than a good scale poorly installed and given no maintenance. But mediocre results cannot be tolerated in modern processing, where profits are intimately tied in with weighing accuracy.

Selection of a proper location for a portable scale will be governed principally by the factor of convenience. Often the handiest location can be determined only through experience. Since these scales readily lend themselves to moving—portability being one of the major factors in their design—it is often more convenient to take the scale to the load rather than vice versa. Where scales are moved frequently, several small spaces should be set aside, specifically for storage of the scale when not in use. These spaces should be out of the path of vehicles and traffic in order to prevent possible damage to the scale.

Permanent Site

Much more careful consideration must be devoted to selecting a site for a permanently installed scale. The problem should be given the same consideration as would be given to placement of a large machine tool or piece of process equipment. These scales become a part of the production line of the plant and should be positioned so that the weighing operation will be in proper sequence with the other processing operations. Decisions as to the location of the scale should not be the sole responsibility of the scale mechanic, but should be the result of a careful study by the production planning department.

From the standpoint of scale operation, the following procedures are pertinent:

1. Locate the scale where it will be easily accessible, but not directly in the path of vehicles which do not require weighing. The scale should bear only the traffic which is brought to it for weighing.

2. Select a location where air currents will not bear on the platform, causing inaccurate readings. This factor is especially important where large platforms are involved and where a scale is located between two floors of a plant. A breeze of 5 mph. velocity exerts a pressure of 0.12 psi. If directed at a truck-scale platform 40 ft. × 10 ft., the breeze will exert a pressure of 48 lb. Such a pressure causes a false reading. If a naturally sheltered location cannot be found, a shelter to protect the scale should be built.

3. Select a floor or road area where the approaches to the scale platform will be level for several feet. While inclines to and from the scale platform are acceptable, the immediate approaches should be level and smooth to avoid bumping each time a vehicle is driven on or off the scale. Care in this respect will eliminate unnecessary horizontal and vertical impacts and hence will reduce the maintenance.

4. Locate the scale dial so that it will be easy to read. In dark locations, provide illumination.

Surveying Food Industry Needs

Food plant managers who have not considered weight control seriously, will do well to survey their operations thoroughly, supplying answers to questions along the following lines:

1. What materials are purchased on a weight basis?
2. What products contain two or more ingredients? How are the proper proportions achieved?
3. At what points is shrinkage apt to occur? How is this measured?
4. At what points in the plant are materials transferred from one department to another? What methods of accounting are used for these material transfers?
5. Are efficiencies of individual departments determined? On what basis are these efficiencies measured?
6. What products are sold on a weight basis?
7. What methods are used to check complete filling and possible breakage in final packed cartons?

The answers to these questions should be tabulated. By making such a tabulation and comparing it with an inventory of the weighing equipment installed, the plant manager may determine how well he is taking advantage of weight control in his plant.

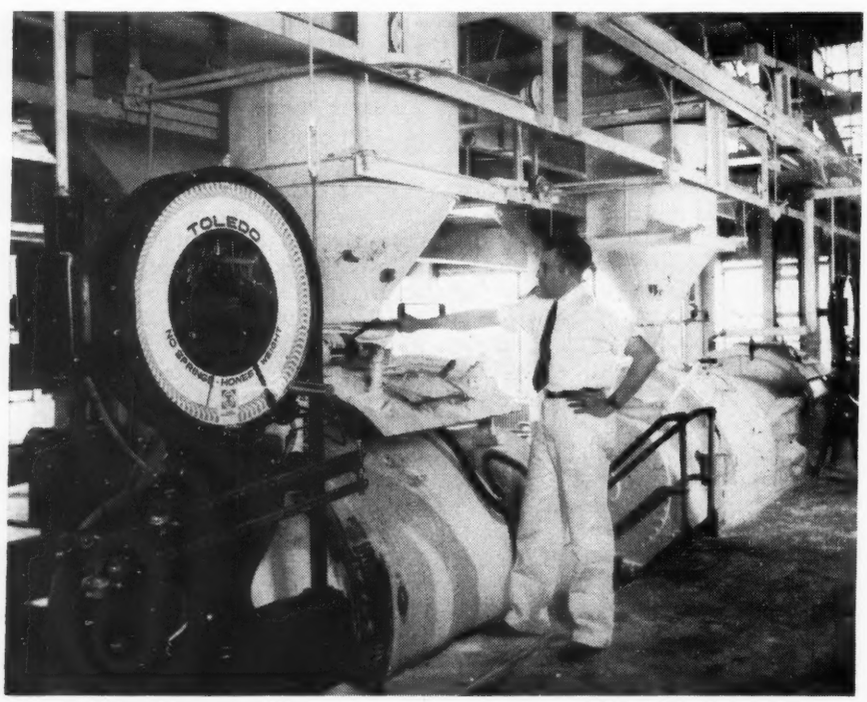


FIG. 22. IN LARGE bakeries, sifted flour is weighed in automatic hopper scales mounted on movable carriages. They provide automatic proportioning of flour to various mixers.

Illustrations contained in this article were used through the courtesy of the following: Consolidated Packaging Machinery Corp.; Detecto Scales, Inc.; Jeffrey Mfg. Co.; Omega Machine Co.; Richardson Scale Co.; Toledo Scale Co. and Yale & Towne Mfg. Co.

Millers State Their Case For—

Chlorine Dioxide in Flour

They ask FSA to approve optional use of newer agent and to consider discontinuance of nitrogen trichloride as soon as practicable . . . Change involves newly designed equipment and altered technics in treatment

By D. B. PRATT, JR., B. A. Eckhart Milling Co., Chicago

IN A RECENT formal request, the Millers National Federation called upon the Federal Security Administration to hold public hearings on the use of chlorine dioxide as a bleaching and maturing agent for wheat flour. This compound was mentioned in an article on flour bleaching and maturing agents in June FOOD INDUSTRIES.[1]

The Millers' request also asks discontinuance of the use of nitrogen trichloride (Agene) as soon as is considered practicable after the hearings have been held.

Summarized, the application for the hearings states the Federation's—

1. Position as spokesman for about 450 companies located in 38 states and making approximately 90 percent of the total commercial wheat flour of the United States.

2. Desire for amendment of existing regulations fixing and establishing definitions and standards of identity for:

(a) flour and enriched flour,
(b) bromated flour and enriched bromated flour,
(c) self-rising flour and enriched self-rising flour,
(d) whole-wheat flour and bromated whole-wheat flour, and
(e) whole-drum wheat flour.

3. Request for inclusion of chlorine dioxide as an optional bleaching and maturing ingredient in the regulations fixing and establishing definitions and standards of identity for flours.

4. Proposal for discontinuance of the use of nitrogen trichloride as soon as practicable in the light of evidence indicating reasonable time needed for making the necessary changes in flour milling methods.

5. Reasons for requesting amendment of regulations, which are:

(a) That oxidation of wheat flour is necessary to make available its full potential baking value; natural oxidation is impractical and uneconomic; oxidation of flour at the mill by means of a suitable agent is practical, economical, and a well established method commonly practiced by most millers.

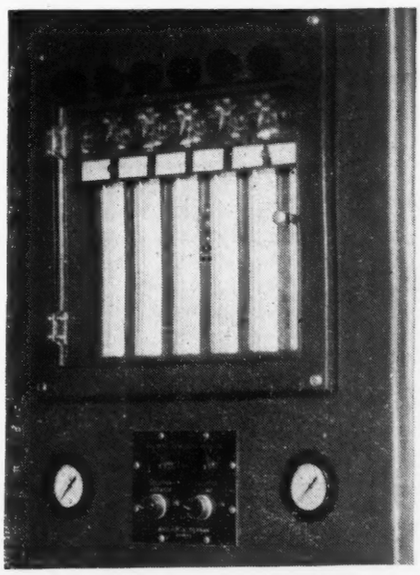
(b) That chlorine dioxide is considered a suitable bleaching and maturing ingredient for the aforenamed kinds of flour, and is free from questionable properties attributed to nitrogen trichloride by scientific investigators.

Equipment Problem

Consideration of chlorine dioxide as a flour bleach is not new. It was proposed as a flour-bleaching agent by disclosures in a British patent [2] granted in 1928 and in a United States patent [3] granted in 1933. The second patent covers the use of chlorine dioxide in combination with other bleaching agents. But lack of interest in these disclosures is indicated by the fact that nothing appeared in scientific or technical literature on its use as a flour bleaching agent prior to the series which was published in 1941 by Ferrari et al.[4]

This tardiness in interest by flour millers in chlorine dioxide very likely is explained by the absence of a cheap and reliable method of producing the gas and by the lack of equipment for metering and generating the gas at place of use.

Because of criticism directed at the employment of nitrogen trichloride for bleaching and maturing flour, intensive attention has been focused for the past several months on the properties of chlorine dioxide and on the design of a machine for its generation and application.



Averting Over-Treatment . . . is essential in bleaching and maturing, hence there is need for precise regulation, as provided by control unit used in Wallace & Tiernan Dyox process (photo shows panel). Experience shows greater susceptibility to such over-treatment with chlorine dioxide, necessitating additional care in application and more sensitive metering devices.

How It Is Made

Chlorine dioxide is conveniently made from the technical grade of sodium chlorite, either by Logan's electrolytic process [5] or by the Cunningham and Losch solution process.[6] The method now under consideration for use in flour mills involves the reaction of an aqueous solution of sodium chlorite with gaseous chlorine:

$$2\,NaClO_2 + Cl_2 \rightleftarrows 2ClO_2 + 2NaCl$$

Diagrams or photos of equipment in use are not yet available for graphic illustration, but it may be pointed out that such equipment must consist of:

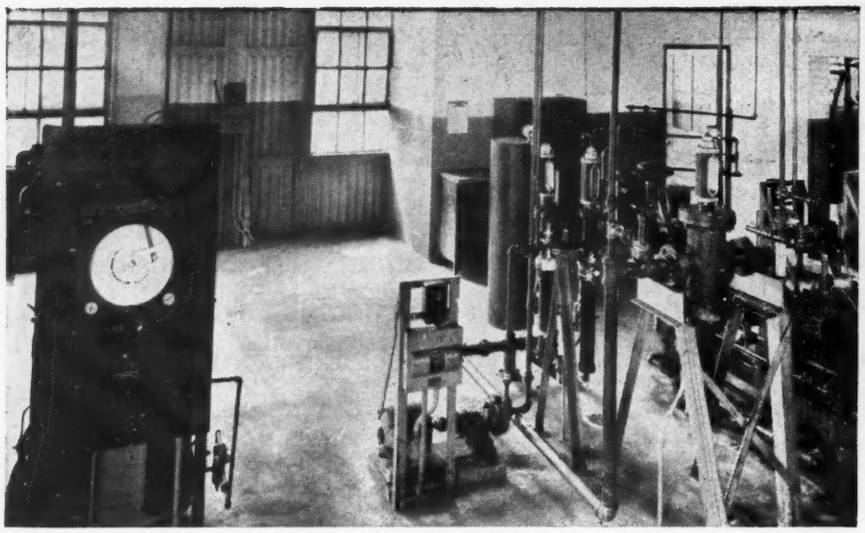
1. A reacting tower or chamber to contain the concentrated aqueous solution of sodium chlorite.

2. Means for metering a supply of gaseous chlorine to the reacting tower.

3. A take-off pump for the generated chlorine dioxide.

4. A piping and metering device connecting the take-off pump with the

(*Continued on page* 213)



Treated With Alkali and . . .

A. At the start of continuous caustic soda process, ratio controller (left) regulates amount of crude oil and caustic delivered through the rotameters (right).

. . . Freed of Soapstock . . .

B. Oil is separated from the soapstock in tubular bowl refining centrifuges.

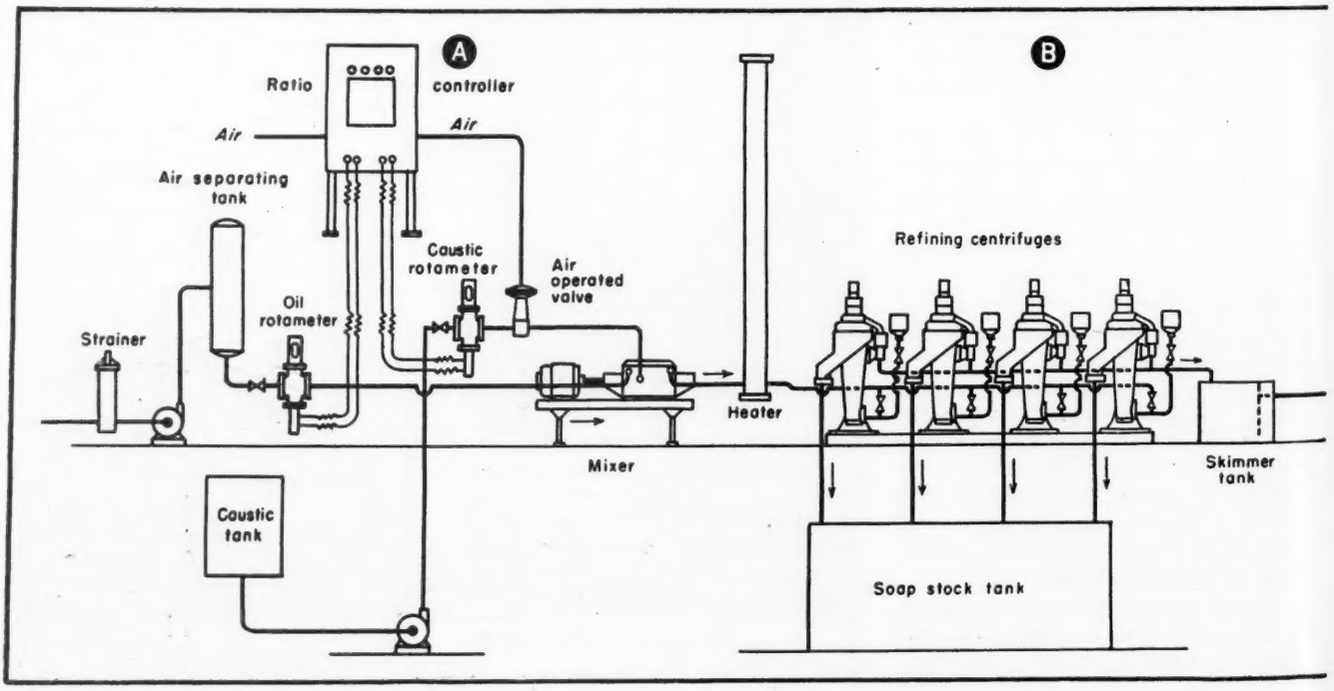
Higher Yields of Better Oils By Continuous Alkali Refining

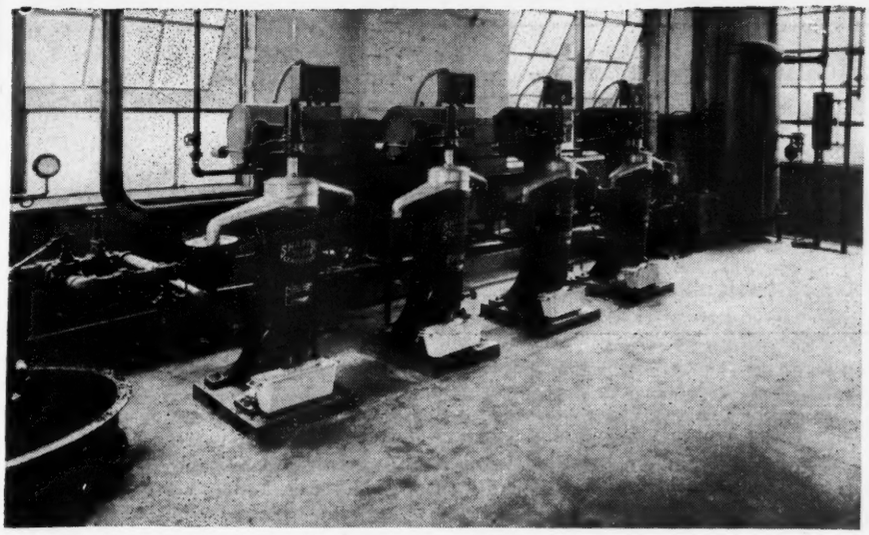
Part I—Centrifugal caustic soda method improves quality, cuts losses of batch system by separating more oil from soapstock and wash waters

By L. D. TYLER, The Sharples Corp., Philadelphia

TO REMOVE IMPURITIES from crude edible fats and oils more efficiently —with maximum yields of high quality fats and oils—there have been developed two continuous alkali methods of centrifuge refining, which reduce losses common in the batch process.

The first of these processes—the centrifugal-caustic soda method — overcame many of the disadvantages in the batch process. By installing high-speed centrifuges, the batch-caustic soda method was made continuous. These centrifuges reduced refining losses at





. . . Oil Is Finally Washed and Dried

C. Residual soaps are dissolved in water. Wash water and oil are separated by centrifuges. Vacuum unit (extreme right) dries oil to low moisture content.

two steps in the process, by separating neutral oil more efficiently from soapstock and from the washing waters.

The second continuous alkali process is the centrifugal soda ash method, which decreased refining losses still further. Greater recovery by this centrifuge method is attributed to the use of soda ash as the neutralizing agent in place of caustic soda.

Patents on the continuous caustic soda process were issued to Refining Unincorporated, N. Y. C., and the first commercial installation was made in 1932 at Procter & Gamble's Cincinnati plant. The continuous soda ash process, also a Clayton process, also was developed by Refining Unincorporated, and was first installed in The Humko Co's. Memphis plant in 1939.

The batch and continuous caustic soda methods of refining crude edible fats and oils will be discussed here. Part II, to be published in a future issue, will detail the continuous soda ash process.

To understand how the continuous caustic soda process was developed, it is well to get the pertinent perspective by reviewing the various approaches to the problem.

Attack on Impurities

Crude fats and oils recovered from vegetable and animal oil-bearing substances by rendering, expressing, or extracting, contain variable amounts of non-oil impurities. Among these are free fatty acids, phosphatides, various organic color bodies, and mucilaginous substances.

The presence of these impurities is objectionable where fats and oils are used commercially, particularly in salad and cooking oils, shortening, margarine, and mayonnaise. They give the oils a dark color, cause them to foam or smoke, impair their keeping qualities, and, in general, contribute undesirable properties to finished products in which they are used.

The most important and generally practiced method of refining is with an alkali, usually caustic soda, sodium carbonate, or a combination of the two. The alkali method of refining—first used batchwise—is employed to remove most of the free fatty acids by converting them into oil insoluble soaps. At the same time, this treatment precipitates the phosphatides and mucilaginous substances. It also has an effective decolorizing action.

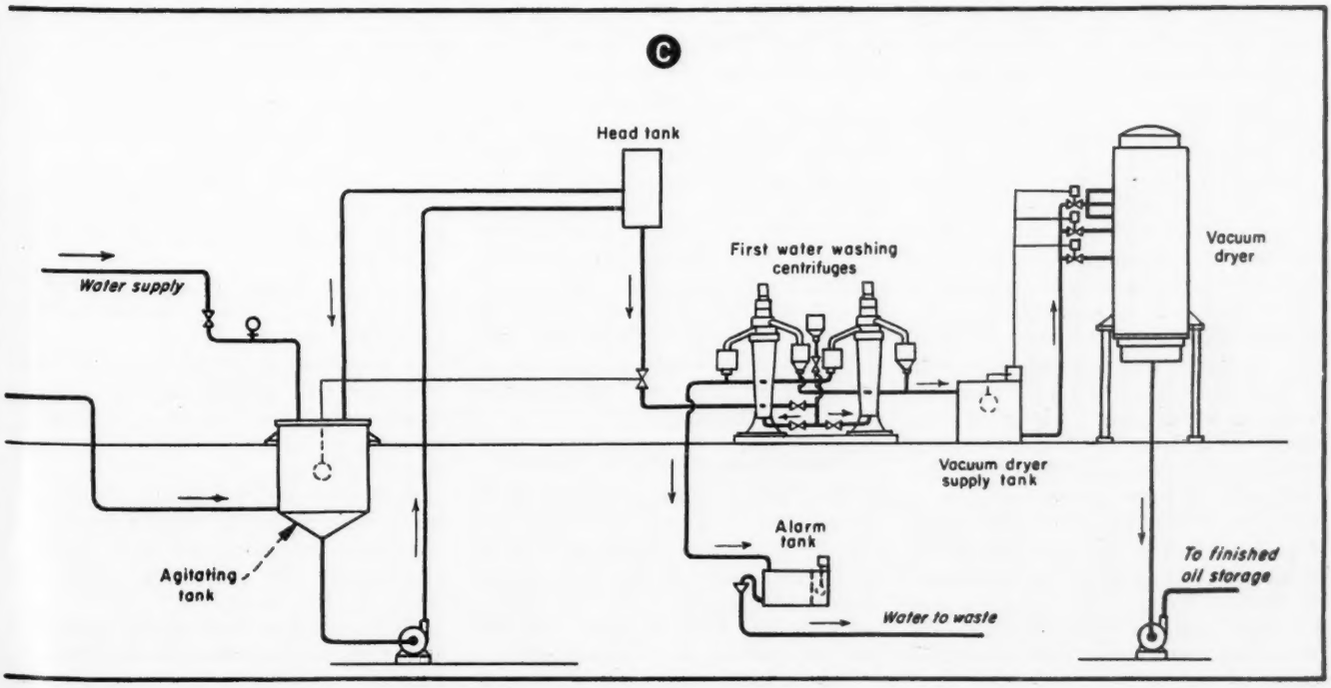
Oils refined by the alkali methods are often subject to further decolorizing and deodorizing treatments before they are used in various products. They may also be hardened by hydrogenation for use in shortening and margarine.

Batch Refining

Before continuous centrifugal refining processes were developed, nearly all alkali refining was done batchwise in refining kettles. These open kettles or tanks are equipped with a two-speed agitator, steam coil or jacket, and a conical bottom. Common size kettles hold one tank car (60,000 lb.) of oil.

The first stage in the refining operation is carried out at ordinary temperatures. Oil is charged to the kettle, allowed to settle (so occluded air can escape), and then agitated.

Next, the proper strength and amount of alkali is added and agitation is continued until the oil and alkali are



Centrifugal Caustic Soda Refining Process—

- **Continuously proportions crude oil and caustic.**
- **Thoroughly and rapidly mixes crude oil and reagent.**
- **Promptly separates soapstock from oil.**
- **Washes refined oil with negligible loss.**
- **Dries washed oil to low moisture content.**

thoroughly emulsified. Emulsification takes 10 to 45 min., depending on the type of oil being refined. The agitation is then reduced to a slow speed, and the oil is raised rapidly to about 140 deg. F. Heating the oil breaks the emulsion, separating and coalescing the insoluble materials from the oil.

After the desired degree of "break" is obtained, agitation is stopped, the heat is turned off, and the heavier insoluble material ("soapstock" or "foots") is allowed to settle overnight to the bottom of the kettle. The refined oil is then drawn off the top by a suction pipe. And the remaining soapstock is sold to soap makers, either directly "as is", or after it has been neutralized in a separate tank and decanted to remove water and inorganic material.

Removing Remaining Soap

The refined oil still has small amounts of suspended soap and water which alter the quality of the oil during storage. A common method of removing water and inorganic matter is to filter the oil through spent earth. In many cases, the oil is first washed with water in the kettle to remove some of the soap.

Oil refined with caustic soda will have a free fatty acid content of less than 0.05 percent, and the color will be greatly improved. However, bleaching with spent earth is often necessary to obtain light-colored oils required for most uses.

Caustic soda is frequently used as the refining agent, because of its effective decolorizing action. But it does have one disadvantage—lower yield due to the saponification of a portion of the neutral oil. Weaker alkalis, such as sodium carbonate, minimize the danger of saponifying neutral oil. But, they do not decolorize the oil as effectively as caustic soda. Moreover, the emulsions formed are difficult to break. And the evolution of CO_2 causes severe foaming and forms porous soapstock, which is difficult to settle. For these reasons, the use of non-saponifying weak alkalis, such as sodium carbonate, in batch refining is limited to a few oils that have low free fatty acid content, and require no improvement in color.

The selection of the proper amount and strength of caustic soda is critical for batch refining. The amount of reagent used is in excess of that required to neutralize the free fatty acid. In general, it is determined by the degree of color reduction needed.

The best strength of the reagent is, of course, that which produces the lowest refining loss and the desired color. Proper treatment varies widely, according to such factors as type of oil processed, its geographical origin, method of processing the seed, and variations in climatic conditions from season to season. Excesses of reagent over that required to neutralize the free fatty acids may range from 0.10 to 0.60 percent sodium hydroxide, and strengths of caustic soda solution may vary from a specific gravity of 10 deg. Be. (6.57 percent NaOH) to 30 deg. Be. (23.5 percent NaOH).

In selecting the proper caustic soda treatment and determining other batch refining conditions, the refiner is guided by laboratory refining tests, conducted in accordance with the methods of the National Cottonseed Products Assn. and the American Oil Chemists' Society. These tests comprise batch refining in miniature, conducted under specific conditions. They indicate the results to be expected when large batches are treated in the plant under the same conditions.

Optimum conditions for plant operation can be estimated from refining tests by: First, using various amounts and strengths of caustic soda and different operating conditions; and second, noting the color and refining losses. Losses obtained in laboratory refining tests closely approximate plant results, and they are used as a check on plant operations. These tests are also used to evaluate the quality of crude oil shipments and to determine the value of the oil.

Drawbacks of Batch Process

The yield of refined oil by the batch method, usually expressed in terms of refining loss, varies widely from oil to oil. Losses may run from 2 to 3 percent on high quality crude oils having low free fatty acid contents to 30 percent or more on poor quality oils.

The disadvantages of the kettle method of refining with caustic soda are:

1. The long reaction time between the oil and alkali—resulting in a high degree of saponification of the neutral oil and greater refining losses.
2. Inefficient gravity separation of the neutral oil from the soapstock. This causes the occlusion of considerable amounts of oil in the soapstock, where it is of considerably less value than as refined oil.
3. The need, because of the nature of the process, of such a high degree of refining skill in: (a) Selecting the caustic soda treats, (b) controlling the operating conditions to produce a good break, and (c) separating the oil from the soapstock.
4. Lack of flexibility in the process, since the reagent treat cannot be adjusted during operation to improve yield or quality.
5. High losses of the neutral oil due to the formation of emulsions and incomplete separation, caused in the water-washing step.

Caustic Soda Process

First notable development in refining crude oil was to increase the yields. This higher production was accomplished by allowing the oil to react more intimately and for a shorter time with the alkali, and by providing a better way of separating the oil from the soapstock. The shorter reaction time between the oil and caustic soda reduced the amount of neutral oil saponified, while installation of high-speed centrifuges minimized the amount of oil occluded in the soapstock.

To attain these objectives, the continuous centrifugal caustic soda refining process was developed and commercially introduced in 1932. This process has largely superseded batch methods of alkali refining of edible and technical vegetable oils in the U. S. as well as in many other sections in the world. The process—

1. Proportions crude oil and caustic soda continuously to provide an accurate, adjustable control of the reagent treat.
2. Mixes crude oil and reagent thoroughly and rapidly in continuous high-speed mixers.
3. Separates soapstock from the oil promptly and continuously in high-speed centrifuges, leaving a minimum amount of free oil occluded in the soapstock.
4. Washes the refined oil continuously with water to remove residual soap, and separates the wash water continuously in centrifuges—with a negligible loss of oil.
5. Dries the washed oil continuously under vacuum to remove residual moisture.

Let us now detail the caustic soda method of refining oil continuously:

Crude vegetable oil is pumped from tank cars or storage into feed tanks equipped with agitators and steam coils. The crude oil is kept at approximately 80 deg. F., and it is agitated to feed it uniformly to the system.

Crude oil is pumped from a feed tank through the crude oil rotameter of a ratio controller. Next, the oil enters the first stage of a high-speed mechanical mixer, which is designed to provide the proper amount of agitation and correct reaction time between the oil and reagent.

Separation With Centrifuges

A supply of caustic soda solution, usually 12 to 24 deg. Be., is made up in separate tanks. The solution is then pumped into the mixer through the reagent rotameter, flow being regulated by the ratio controller. The latter assures delivery of a controlled, percentage of caustic to the mixer in proportion to the flow of crude oil, by the automatic positioning of an air-operated valve on the reagent line. This controller is set to give the desired percentage of reagent in accordance with the type of free fatty acid content of the oil handled, and it may be adjusted any time during operation by turning the selector dial.

After the crude oil and caustic emulsion is mixed, the mixture travels into a heat exchanger. Here, the temperature is raised to 140-160 deg. F. by low pressure steam. Heating breaks the emulsion into the oil and soapstock phases. The mixture is then continuously separated in specially designed high-speed centrifuges—disk or tubular bowl types. The oil is discharged into a receiving tank, and the soapstock falls by gravity from the hopper of the machines into a soapstock tank. The oil has been in contact with the alkali for about 3 min.

Since centrifuges operate continuously they require little cleaning to remove heavy dirt or meal that accumulate in the bowl.

A small amount of the residual soap remaining in the oil discharged from the centrifuges is removed by washing the oil with water. Oil leaving the centrifuges flows by gravity into a small tank, equipped with steam coils and a temperature regulator. Here, the oil is kept at 160 to 180 deg. F. Then about 10 to 20 percent hot water is introduced into the tank through a flowmeter.

The bottom of the wash tank is cone-shaped, and it is provided with an outlet connected to a centrifugal pump with about triple the capacity of the continuous flow through the plant. The pump circulates the mixture of oil and water through a small elevated feed tank connected to the water-washing centrifuges. The feed line contains a float valve, regulated to maintain a fixed level in the wash tank. Rapid circulation of the oil-water mixture provides intimate contact between the water and oil for approximately 10 min.

During this time, the residual soap is dissolved in the water. A portion of the mixture is delivered continuously to high-speed centrifuges (either the tubular bowl or disk type), where the soapy wash water is separated from the oil.

In many plants, the washing step is repeated at about 180 deg. F. to assure a more complete removal of soap, thus improving the keeping qualities of the oil.

Vacuum Drying

Oil discharged from the water-washing centrifuges may have as much as 0.5 percent moisture. This water must be removed to prevent an increase in the fatty acid content of the oil during storage.

Water is removed from the oil by a vacuum drying system. The vacuum drier is a vertical cylindrical tank, which is maintained under a reduced pressure of 1 to 1½ in. of mercury by means of a steam eductor and barometric condenser. "Wet" oil is continuously sucked from a feed tank and fed into the drier chamber through spray nozzles. The feed to the drier is controlled by solenoid valves, operated by a float switch in the feed tank. The water is flash-evaporated from the finely atomized oil in the evacuated chamber, and leaves through the vacuum system. "Dry" oil containing less than 0.05 percent moisture is continuously withdrawn from the bottom of the drier and pumped to storage tanks or further processing.

Selection of Reagent Treat

The amount and strength of caustic soda solution used for treating the crude oil in the continuous centrifugal caustic soda process is selected on the basis of the type of oil, the free fatty acid, and the laboratory refining tests, as in batch refining. In most cases, however, a smaller excess and a lower strength of reagent may be used in the continuous process to produce an oil of equivalent quality to that refined by the batch process. In addition, it is possible to alter the amount of treat at any time during operation to improve the quality of the refined oil.

Low Refining Losses

The amount of oil recovered by the continuous caustic process is greater than that obtained by the batch method. Reason for this is twofold: First, there is less saponification by neutral oil because the reaction time between the oil and the reagent is reduced. Second, more efficient separation of oil from soapstock is accomplished by the use of centrifuges.

When refining to an equivalent color and free fatty acid content, refining losses are 20 to 30 percent under those encountered in refining the same oil in the kettle. For instance, crude cottonseed oil with 1.0 percent free fatty acid showed a 6 percent loss when batch-refined. On the other hand, this same oil may show a 4.5 percent loss when refined by the continuous caustic soda process—a saving of 25 percent.

The losses in continuous centrifugal water-washing are negligible. Analyses of the wash water have shown an average oil loss much less than that encountered in batch-washing and gravity-settling.

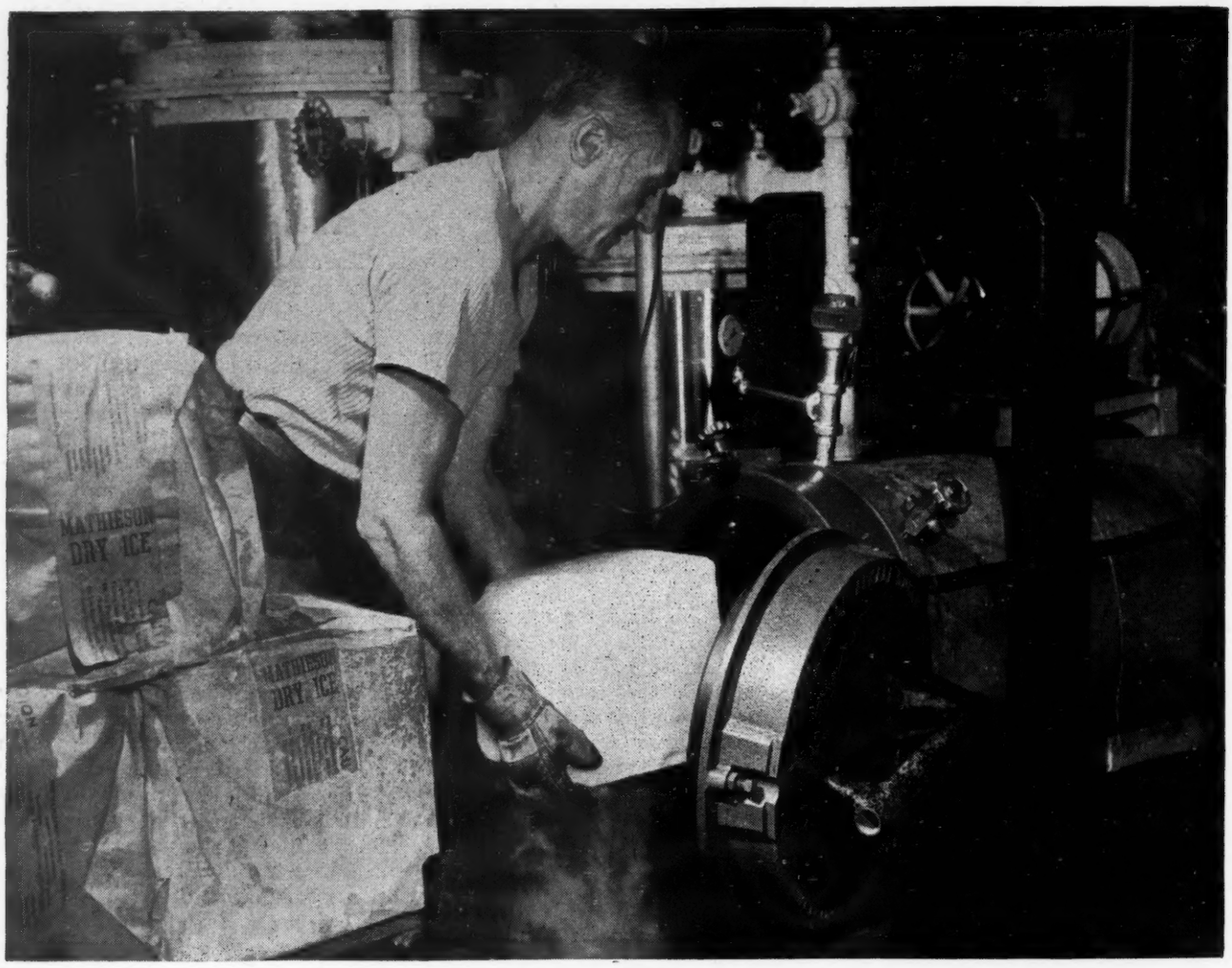
(*Continued on Page* 211)

Batch vs. Continuous

Tests Evidence Reduced Losses and Purer Oils With Centrifugal Caustic Soda Refining

(Cottonseed Oil)

Test No.	F. F. A. of Crude Oil (Percent)	Refining Loss (Percent)		Color of Refined Oil (Lovibond Units)		Bleach Color (Lovibond Units)		F. F. A. of Refined Oil (Percent)		Refining Loss Saving by Continuous Caustic Process (Percent)
		Batch	Continuous	Batch	Continuous	Batch	Continuous	Batch	Continuous	
1.....	1.4	6.7	4.8	7.3	6.9	1.6	1.6	.011	.015	28.3
2.....	3.5	11.7	9.0	10.7	9.5	2.3	2.3	.009	.025	23.1
3.....	0.9	5.9	4.2	6.2	6.9	1.7	1.7	.005	.015	28.8
4.....	1.8	8.2	5.7	7.4	7.4	1.7	1.7	.013	.018	30.5
5.....	3.7	11.7	8.9	11.0	9.5	2.3	2.3	.015	.024	23.9
6.....	2.5	9.2	6.7	8.2	8.1	1.9	1.9	.017	.020	27.2
7.....	1.7	7.5	5.3	7.5	7.7	1.9	2.0	.015	.020	29.3
8.....	1.9	8.0	5.9	7.3	8.1	1.6	1.9	.015	.018	26.2
9.....	2.7	9.4	6.6	9.5	9.3	2.4	2.2	.018	.025	29.8
10.....	3.1	10.8	8.6	10.3	9.0	2.3	2.2	.018	.027	20.3
Average	2.32	8.91	6.57	8.5	8.2	2.0	2.0	.014	.021	26.3



DRY ICE

Economical CO_2 Source For Bottlers

By means of converters it is changed to liquid for use in carbonators, saving handling of cylinders or expense of refrigerating low-pressure liquid CO_2

BY G. B. ARMSTRONG, Manager Carbon Dioxide Division, Mathieson Chemical Corp., New York City

BECAUSE of its high density and particularly its ease of transport, dry ice is the least expensive form of carbon dioxide for the bottler of carbonated beverages. This is particularly true for plants that are located close to adequate supplies of dry ice. Here, deliveries by means of insulated trucks or insulated shipping containers, may be made as required with the elimination of vaporization losses usually associated with the transportation of dry ice.

There are two important requirements for the carbon dioxide used in the beverage industry: The gas must be exceedingly pure, tastless and odorless; and it must be inexpensive and easily applied. This is true of the gas used for carbonation of soft drinks, and also of that used as a source of pressure for dispensing draught beer.

To obtain CO_2 of sufficient purity, the gas must be carefully manufactured. By-product CO_2 from coke ovens or fermenters is often used, and limestone is another very satisfactory source. However obtained originally, a high quality product involves a careful purification process.

Since handling and transporting large volumes of gas would be uneconomical and cumbersome, the CO_2 is cooled and compressed to a liquid at the manufacturing plant. To maintain it in this form, the CO_2 must be kept under pressure. It is therefore generally placed in cylinders under a pressure of about 1,000 psi.

Liquid CO_2 may also be kept at lower pressures, but in this case some method of refrigeration is required. In either case the liquid is readily transformed

to a gas by opening the valve and thus releasing the pressure.

The volume may be still further reduced by cooling and compressing the liquid until solid carbon dioxide (dry ice) is formed. Through the use of suitable equipment, dry ice may be converted back to the liquid, which may then be applied in the usual manner.

Three Sources

Thus, the beverage industry has these three choices—high pressure liquid CO_2 in cylinders, low pressure refrigerated liquid CO_2, and dry ice. Decision as to which source is preferable can be made on the basis of the individual circumstances involved—the quantities of gas used and the location of the plant.

The most widely used source at the present time, especially where the volume required is not unusually large, is the high pressure 50-lb. capacity cylinder of liquid CO_2.

In the bottling plant the cylinders may be attached to a manifold. In this way, it is possible to withdraw the CO_2 from a number of cylinders without interruption. Replacement of empty cylinders can also be accomplished without affecting the flow of gas to the carbonator.

Recently, new cylinders have been developed which are of chrome-molybdenum steel. These are about 20 percent lighter than the old type and thus are cheaper to ship and easier to handle.

The use of dry ice in the bottling plant is a means of eliminating the handling of cylinders, and of receiving bulk deliveries of low-pressure CO_2. Dry ice is produced at the plant in 10-in. cubes, weighing about 55 lb. each. The blocks are enclosed in heavy kraft paper bags and shipped in light weight corrugated fiber containers holding one or two cakes, or in larger quantities in special insulated carriers. In many cities deliveries are made in insulated trucks operating from distributing warehouses.

For the conversion of dry ice to liquid CO_2 at the bottling plant, units of various sizes and capacities have been designed. The size unit to be installed is governed by the requirements of the bottling operation.

There is, for example, the 150-lb. capacity converter unit illustrated below. To charge this unit the cakes of dry ice must be broken into smaller pieces. After the dry ice is inserted and the cover is fastened, this unit becomes a high pressure cylinder containing liquid carbon dioxide. Its capacity is equivalent to approximately three 50-lb. high pressure cylinders of the type generally used in the industry.

Multi-Unit Installations

Several of these units may be attached to a manifold to supply an uninterrupted flow of gas to the carbonator. Thus, a multi-unit installation made up of six of these converters occupies a floor space measuring only 9 x 3½ ft.

Larger units are also available. These larger converters have openings sufficiently wide to permit whole blocks of dry ice to be inserted without breaking or crushing. There is the 600-lb. converter of 18-in. diameter and 12 ft. length, weighing 2,900 lb., and taking 12 blocks of dry ice.

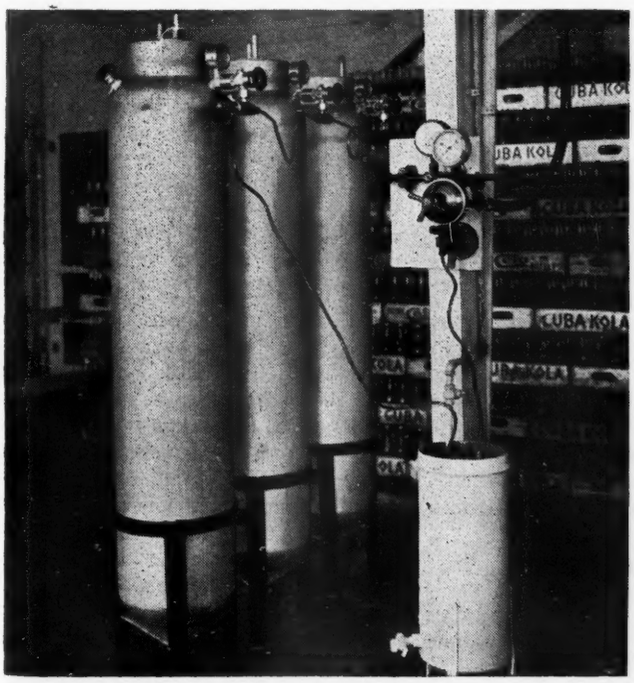
A still larger one, with 1,000 lb. capacity, is of 18 in. dia. by 19-ft. length, weighs 4,500 lb. and takes 20 blocks of dry ice. These units have no moving parts or control apparatus, and they require no auxiliary mechanical refrigeration system.

Charging Converters

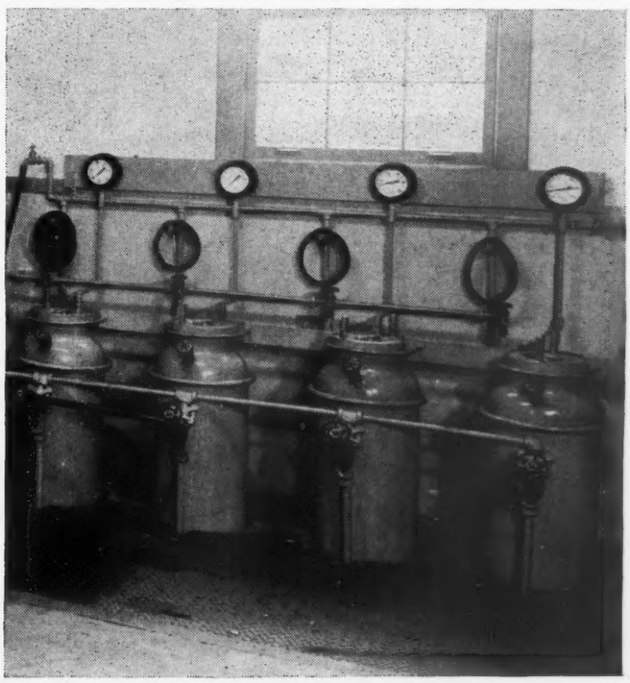
One type of converter has a hinged door at one end; another has a lid which is screwed into the opening. To charge a unit, the door or lid is opened, the full blocks are inserted, then door or lid is promptly closed and fastened tightly. Next, the vent valve is closed, and liquefaction begins immediately. This liquefaction may be speeded by spraying water over the surface of the converter.

The large converters, made in accordance with the ASME unfired pressure code for 1,400 lb. working pressure, are tested to 2,800 psi. hydrostatic pressure. They are equipped with three ¾-in. dia. gas outlets and two 1-in. dia. liquid outlets, to permit flexibility in piping. All of the unused outlets are plugged.

The converters may be installed vertically above or through the floor ("pit" installation), but certain types are more frequently installed horizontally. They may also be manifolded together in any number, to supply an uninterrupted flow of gas in as large quantities as may be desired.

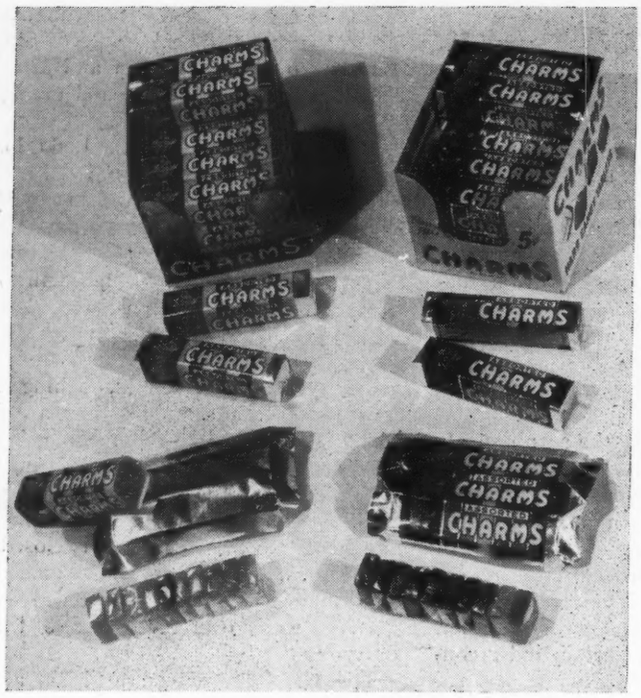


Small Units May Be Set Above . . .



. . . Or Below Floor Level

Attached to a manifold, several 150-lb. cylinders form a multi-unit converter which supplies an uninterrupted flow of gas to carbonators.



Old Gives Way To New

ORIGINAL package (left) has ten cellophane-wrapped tablets which are over-wrapped without sealing in a paper-backed foil wrapper and a printed label that is glued. New package (right) contains individually wrapped candies which are over-wrapped and heat-sealed in a laminated foil wrapper, printed in five colors

Overcoming obstacles with advanced package engineering, Charms doubled productive capacity of its plant, cut unit labor costs 67 percent, economized on the floor space, and reduced the number of machines on each line. Special printed wrapper omits use of a separate label and gives increased protection as well as added attractiveness to hard candies. Package is also more rigid than the former one

Candy Packaging Improved With New Machines

By JOHN V. ZIEMBA
Assistant Editor
"Food Industries"

SUPPOSE a food company seeks to employ advanced engineering in its own plant—but finds that the requisite equipment is not available on the market. Worse than this, suppose it also finds that no equipment present can be adapted for the needs. And what's more, that no company is in a position to develop the required machinery.

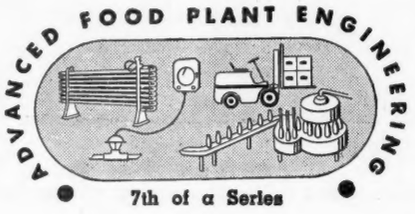
This situation was no supposition with Charms, Inc., Bloomfield, N. J. It was hard fact. Yet, company executives did not throw up their hands. They got their advanced engineering anyway. Here is the story:

Back in 1939, the company sought additional machines and the usual replacement parts from Germany—but then Hitler went to war and they couldn't get them. And that posed a vital question: "How were they to keep their hard candy packaging lines operating?"

First move to surmount the difficulty was a check of the domestic machinery manufacturers. But one after another reported that no suitable units were available. Charms literally combed the country. But it was no use.

Next, executives searched for machines of a similar type which might be adapted, by re-building, for their purpose. But this idea also led to a dead end.

Final disappointment came when no development engineering concerns could be found to make the specialized equipment. And by this time, America's entry into the war had brought pressing restrictions, putting new hurdles in the path of the machinery makers.



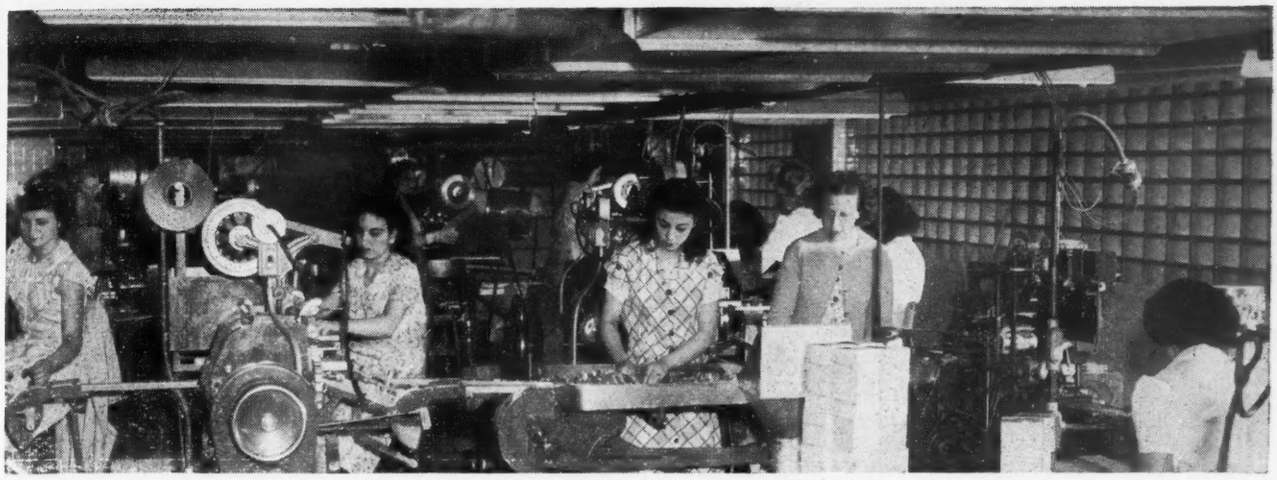
7th of a Series

How Difficulties Were Overcome

Then Charms, as a last resort, put the problem before its own engineers —and in the "all out" effort which followed, the persistence and ingenuity of these men won out over the obstacles. They did the job on their own. In fact, they did more. For in the course of events, the company's "know how" surpassed mere machinery replacement. They developed brand new units—capable of handling a new package at efficiencies not hitherto attained.

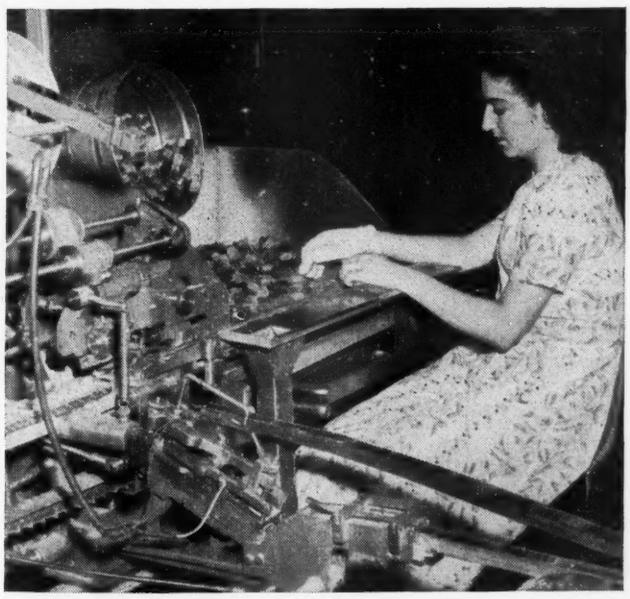
Development of the new package came first. It consists of a special laminated foil wrapper that gives hard candies increased protection and added attraction.

Development of packaging machines to handle the new package came next. Each new packaging unit wraps the



OLD packaging line, converted to handle new package, requires five machines and seven girls. Ten-tablet wrapper and sealer replaces former wrapping and gluing machine. It takes production from four tablet wrappers.

NEW packaging line requires fewer machines and half as much floor space to wrap the same amount of candy as the old line. And it needs only three instead of seven girls to run it. Remaining four girls are available for other work.



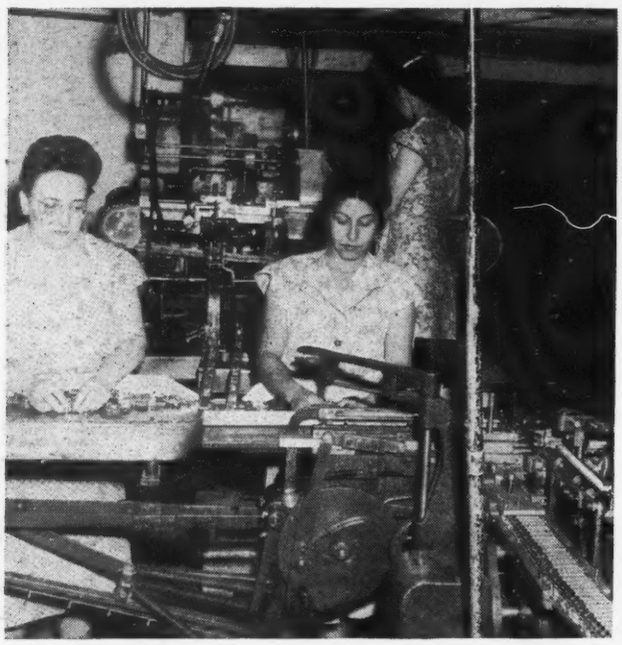
OLD machine cellophane-wraps tablets for new package at rate of 150 a min., while new one does 300 a min.

WRAPPED candy tablets are stacked in groups of ten on old line, which has now been converted to handle new package.

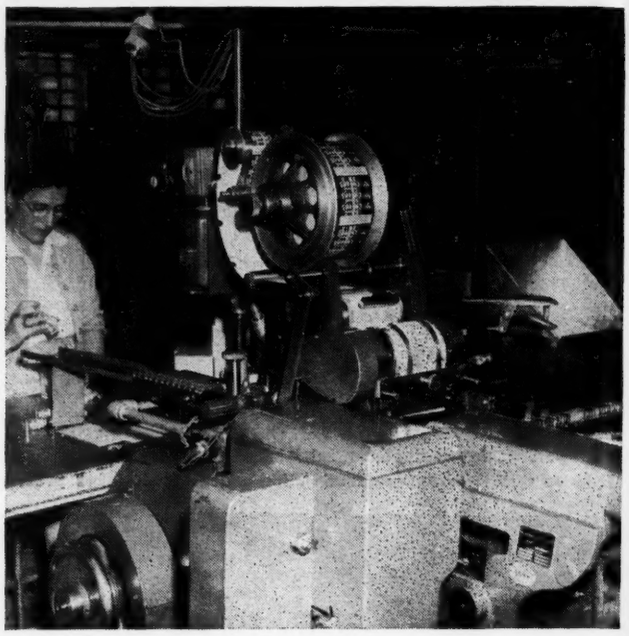
same amount of candy as the old one (60 nickel-size packages a min.)—but it doubles the productive capacity of the plant. It also reduces: (1) The number of machines about 40 percent, (2) floor space about 50 percent, and (3) labor costs about 67 percent. Furthermore, it releases operators from the old packaging lines to run more of the new units.

The old package contained ten candy tablets that were individually wrapped in cellophane. The tablets in turn were overwrapped without sealing in a paper-backed foil wrapper and a printed label that was glued. But the old package had three shortcomings First of all, the cellophane wrapper

Wrapping-Sealing Unit Was First Built Into Old Line To Handle New Package



OLD line—old package. Overwrapping the ten candies with paper-backed foil wrapper and a printed label that is glued.



OLD line—new package. Wrapping machine wraps and seals candies delivered from four tablet wrappers.

CONSUMER packages are packed by hand into display cartons—20 to the carton. Packer also sets up the cartons.

DISPLAY cartons are finally machine-wrapped and heat-sealed in waxed paper. Then they are packed in shipping containers.

was hard to remove, for it was tightly heat-sealed to the candy. Next, the combination of wrapper and label, since they were not sealed, failed to protect the candy adequately. Finally, gluing of the printed label to the wrapper added to the cost of packaging.

All these shortcomings were finally overcome by: (1) Applying a light heat-seal only to the folds of the cellophane wrapper; (2) using a special, heat-sealable, 3-ply material for an overwrap; and (3) omitting the label entirely and printing directly on the new wrapper.

Work was begun on the new package several years ago when the candy company called upon Marathon Corp., Menasha, Wis., to aid in the development of a new package that would overcome the shortcomings of the old one. In working out the problems of the new wrapper, emphasis was also made on two additional features—moistureproofness and rigidity.

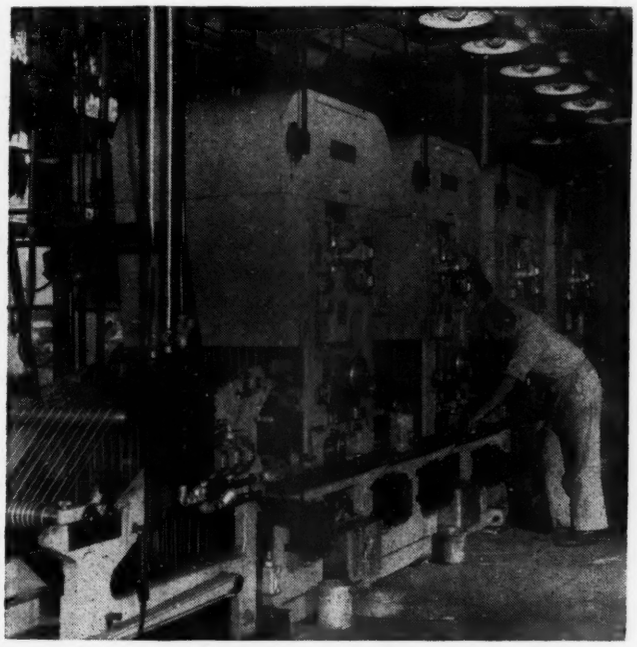
Protection against moisture is the most important requirement of a wrapper used for hard candies like the square Charms candies. If a wrapper is not moistureproof, physical changes will take place in these candies. It requires only a small amount of moisture to cause the candies to "sugar". And once hard candies start to sugar, they become soft and grainy—no longer a hard candy. Not only that, they also lose their color and flavor.

By using a more rigid wrapper, square hard candies can be kept from falling out of the wrapper, once it has been broken. Square candies do not have a tendency of remaining in a broken wrapper as do the round ones. Therefore, it is necessary to individually wrap square candies in cellophane to protect them from lint and

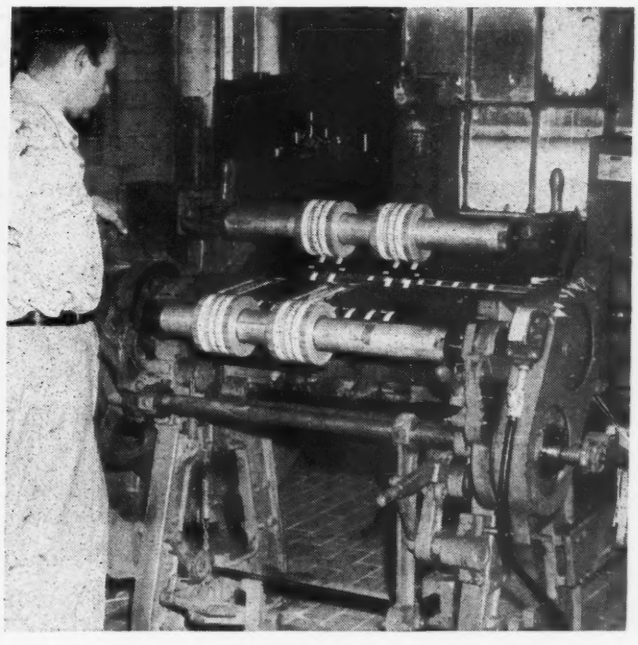
Plant Also Cans Charms Candies and Prints Its Own Cellophane

CANNING candies is another packaging operation. Here Charms are packed by hand into metal containers for export trade.

CANS holding 20 packages are fed to an American Can Co. line, which applies a lid to the can and seals it under a vacuum.



COMPANY also prints its own cellophane. Here four-color Champion presses print a 20-in. roll of moistureproof cellophane.



AFTER a roll of cellophane is printed, it is slit to the proper size—1¾ in. wide—for the candies. Printing is on reverse side.

dirt, whenever they fall out of the wrapper into pockets and hand bags. In addition, the cellophane wrapper keeps the candies from sticking to one another, especially under warm and humid conditions.

Tests were centered around a 3-ply material containing buried-foil as a wrapper for Charms candies, because this type of a wrapper showed up under wartime conditions as the best material for moisture protection. In the course of developing the new wrapper, many combinations of materials were laminated to aluminum foil, using various laminants and heat-sealing coatings. Finally a suitable wrapper was developed. It consisted of aluminum foil laminated to moistureproof cellophane and a thermoplastic coated bleached sulfite paper. By printing the reverse side of the cellophane sheet, the old label no longer became necessary, and scuffing of the printing was avoided.

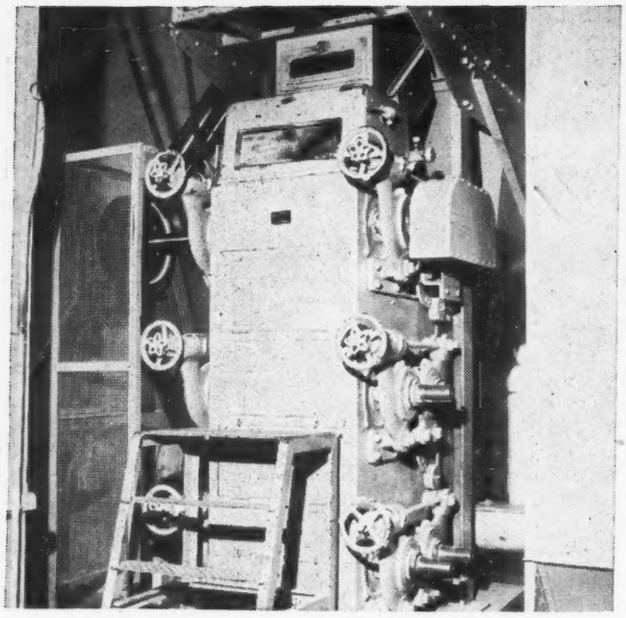
Before the new wrapper was perfected, however, the manufacturer of the wrapper had to overcome several problems. For example, when certain laminants were used, delamination occurred. Furthermore, some of the thermoplastic coatings tried out not only gummed up the heat-sealing unit but also penetrated through the wrapper, making it sticky. On some occasions, the coating even stuck to the individual cellophane-wrapped candies, making separation of the wrapper from the candies extremely difficult.

New Packaging Line

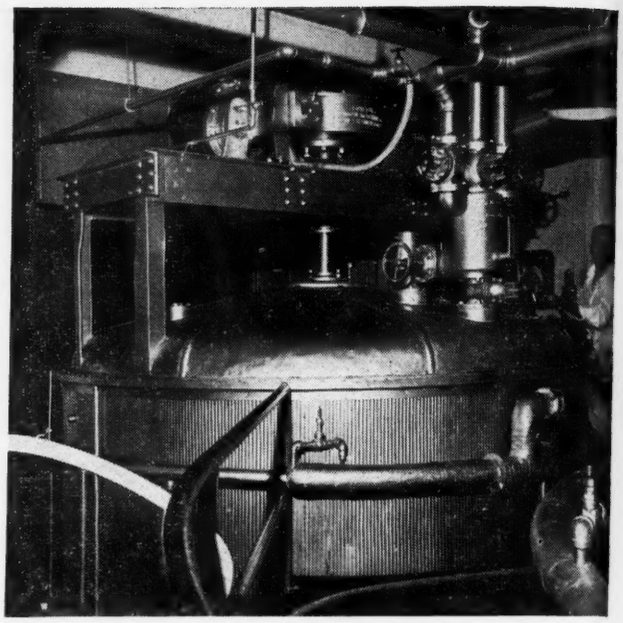
Charms' rebuilding of its packaging line was carried out in two steps:

First step was to change the regular line to handle the new package. One of the changes was in adjusting the heat-sealing mechanism so that it ap-

(*Continued on page* 212)



1. MALTED BARLEY is crushed in this specially constructed roller mill, then mixed with warm water to form malt mash.



2. MASH is cooked in these tanks until the starch has been converted into sugar by enzymatic action.

Beer Through The Ages

Beer was made by the Egyptians more than 5,000 years ago. But it remained a household art until 600 years ago. Now it is a great modern food industry

By HENRY R. HENIUS, Vice-President General Brewing Corp., San Francisco, Calif.

AS far back as 3,700 B.C., a fermented product known as Sura, was made in China where millet was used as a brewing material. In ancient Egypt, possibly about the same time, beer brewing and bread making were associated. Thus the art of brewing is at least 5,000 years old.

It is of interest that in ancient Egypt some barley was used in making beer, this particularly since in modern brewing the basic material for all beer is malt made from barley. True, wine was used by the early Egyptians, but beer was preferred by the people. So great was the need of the ancient Egyptian for beer that his prayers for a safe journey for the dead, through the perils along the road to his union with the immortals, included not only supplication for food but also for beer. Beer in those times was almost universally a sweet drink.

During medieval times, beer was in common usage amongst those races inhabiting central Europe, Scandinavian countries, and Great Britain. Even France, although largely a wine consuming country, had a notable brewing industry, and still has. Furthermore France produced the "Father of modern brewing science"—the great Louis Pasteur.

Hops Introduced

Beer remained a sweet beverage in all European countries until about the 11th century when hops were first introduced in Finland. Then in rapid succession it was introduced in the other Scandinavian countries, and in Germany and England about the end of the 14th century. Prior to the use of hops, various herbs were utilized in an endeavor to add zest to the beer as it was then produced, and further to reduce sweetness to a minimum.

"Just Plain Interesting"

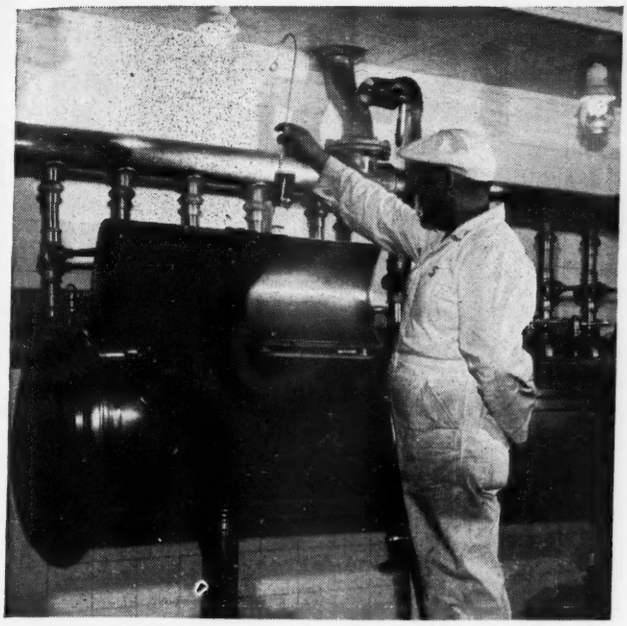
Now and then we come across a story which does not tell how to do something better, but which is just plain interesting. This is one of them. We recommend it for those who like to know how a major food industry got that way.—*The Editors.*

Brewing during that period was almost entirely a household art, in fact it was a household necessity. The first commercial phases were probably carried on by the English during the 14th century. During that period commerce and beer became a rather significant feature in the foreign trade of Germany, Austria, the British Isles and the Scandinavian countries.

When immigration to the United States began, the immigrants were chiefly from the northern countries of Europe. They brought with them their brewing practices and their taste for beer. Historical records seem to indicate that the shortage of beer supplies aboard the Mayflower was actually responsible for the landing of the Pilgrims at Plymouth.

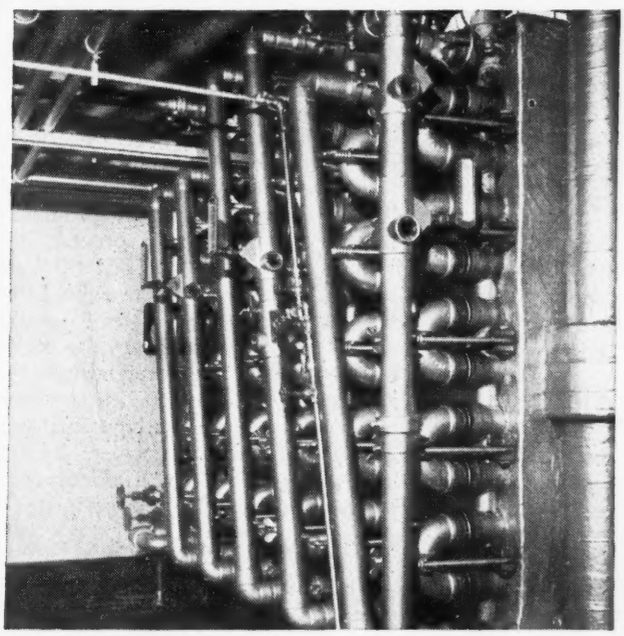
Numerous claims have been made as to the location and establishment of the first brewery in what is now the United States. One is that the Dutch West India Company built the first brewery in Lower Manhattan, New York, in 1623. Another claim is based on a law of 1627 of the Massachusetts Bay Colony, which bestowed an exclusive right of brewing upon a Captain Sedgwick.

For a long time, brewing remained largely a household occupation in the

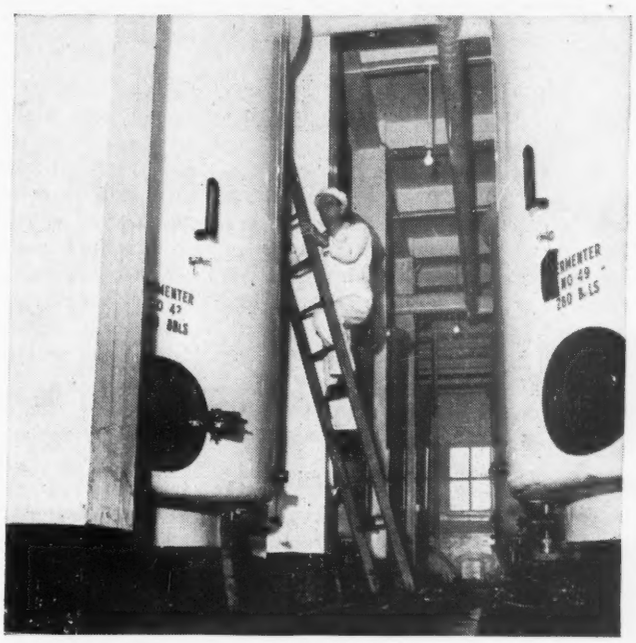


3. RUN-OFF LIQUOR from Lauter tanks is checked for clarity as it flows into brew kettle. (Marvin Wingrove photo)

4. HOPS are added to boiling wort at regular intervals. Boiling goes on until albuminoids are coagulated. (Saul Miller photo)



5. WHEN ALBUMINOIDS are coagulated, wort is clarified and cooled on Baudelot cooler to between 40 and 50 deg. F.



6. BEER is held in these fermenting tanks from 9 to 11 days at a carefully controlled temperature near 40 deg. F.

U. S., which was a custom very thoroughly revived during the 13 years of so-called national prohibition. In those early days, professional brewers were scarce, and a great drawback to the rapid development of beer consumption was the abundance and cheapness of rum and whiskey.

It is perhaps little known that, when Washington became president, so universal was this distilling practice that in the State of Pennsylvania alone there were about 5,000 stills.

Leading minds in colonial and early national times were in agreement on the principle that, to curb the widespread use of strong drink, the best means would be to encourage the use of fermented beverages such as beer. Some of the states were very liberal in their policies towards the brewers. Everything possible was done to promote the industry, including, in some instances, exemption from all taxes for a period of years.

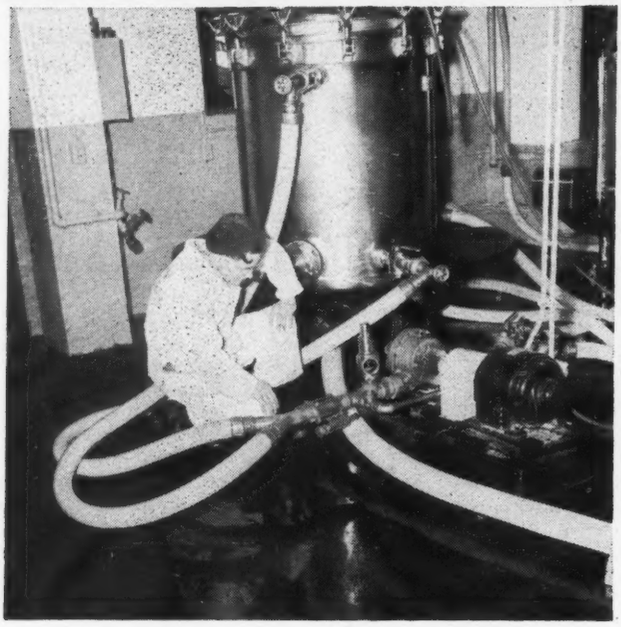
Refrigeration Developed

Due to competition from cheap distilled liquor, and because beer, being extremely perishable, was difficult to transport, production in the United States remained in a rather primitive state for many years. With the arrival of the steam engine, rapid transit by rail, and finally mechanical refrigeration, beer quality improved notably.

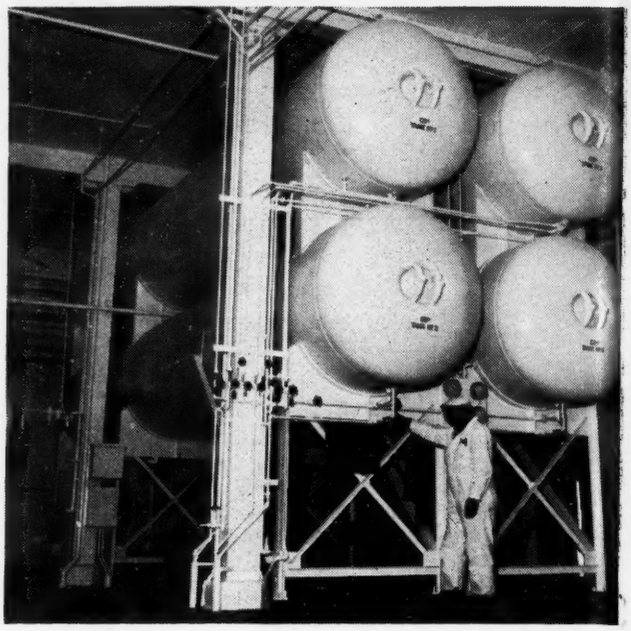
The early pioneers in mechanical refrigeration developed their machines for American breweries between 1860 and 1870. This enabled the industry to take a great stride forward. It is also recorded that the first commercial air conditioning plant in America was installed in a brewery in Alexandria, Virginia in 1880, and that the first patent on air conditioning was obtained by a brewer, John Portner.

Until the period just prior to World War I, the people of this country were supplied with a well-flavored, aromatic, sparkling beer that was thoroughly fermented. In most instances it was of excellent keeping quality, low in alcoholic content and reasonably priced.

CO_2 From Fermentation is Used to Charge Filtered Beer



7. AFTER STORAGE, the beer is stabilized, clarified and filtered to remove suspended solids. (Saul Miller photo)



8. CO_2, produced during fermentation, is compressed and stored in these tanks, then used to carbonate finished beer.

The so-called dry era, from January, 1920, to April, 1933, completely destroyed legitimate brewing.

The dormant brewing industry was re-established on April 7, 1933, when beer with an alcoholic content of not more than 3.2 percent by weight again became legal. On December 5, 1933, the 18th Amendment was amended, thereby automatically removing restrictions on the alcoholic content of fermented beverages and distilled liquors, except in those states that had conflicting laws.

Modern Brewing Practice

The first requisite in establishing and building a brewery is careful consideration of the water supply. Good beer can be made only from good materials, water being one of the most important. In brewing, water is classified according to its mineral constituents, organic substances and its origin. All waters used must be chemically adjusted for the various phases of work in the brewery.

With few exceptions, at least in the U. S., water for the brewery is procured from the city water supply or from wells. Such city water, suitable for human consumption, is, at least from the standpoint of purity, suitable for brewing purposes. It is treated differently for boiler feedwater, where softness is of paramount importance, than in the actual brewing operation, where water is treated to make it moderately hard. In order to maintain uniformity in brewing operations, all water is carefully checked daily and the necessary adjustments are made.

Many breweries have their own sources of water supply through shallow or deep wells. In some instances, such water supply is well suited for boiler feed and brewing purposes and thus only a nominal supply of municipal water is required. When water from wells is unsuited for either boiler feed or brewing it may prove satisfactory for cooling purposes in connection with condensing engines or refrigerating unit condensors.

Other Materials

The other materials that enter into the brewing of beer must receive the same careful consideration as that given to water. These materials are all grown or produced in the U. S. The most important is malt made from barley. Others are rice, corn, corn sugar, and hops.

The barleys, from which malt is produced, are grown in many midwestern and western states. With rare exceptions, all of them are of 6-rowed type. Some 2-rowed barley is still grown, but very little of it is utilized in making malt. Due to climatic conditions, the barleys grown in California, Oregon and Washington are considerably different in general properties from the barleys grown in Wisconsin, Iowa, Minnesota, the Dakotas and other midwestern states.

In many of the barley growing states, the state agronomists, collaborating with the Bureau of Plant Industry, USDA, have done, and are still doing a great deal of research work in connection with improvement of barley strains in an effort to obtain higher yielding barleys and ones that will produce better malt.

Briefly, the malting process consists of: Grading; removing the dust, foreign seeds and broken kernels in order to obtain a uniform, clean barley; steeping in water for from 40 to 60 hours; germinating; kilning.

During the steeping process, the barley picks up large quantities of water, its increase in weight being approximately 45 percent. After the desired degree of steeping, the barley is brought into the germinating compartments. At one time, all germination was conducted on smooth floors. Today practically all modern malting houses use either the drum or compartment system.

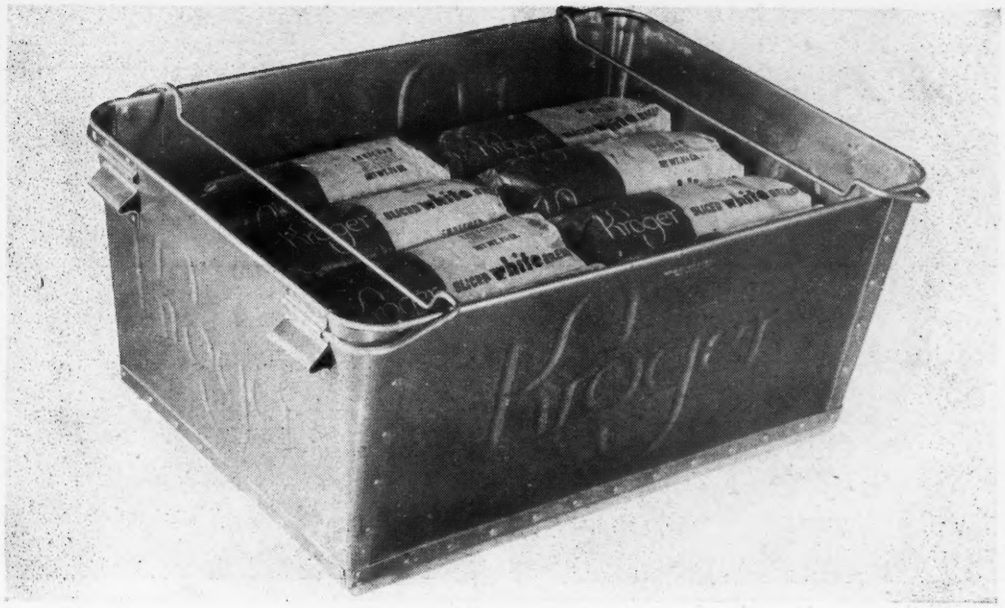
Malt Germination

The purpose of germination is to develop and accent the brewing value of barley through enzyme development and endosperm modification. The acrospire should develop to approximately ¾ the length of the kernel. At this stage the malt is known as green malt and is now ready to be transferred to the kiln.

The kiln is usually a 2-story structure, with floors of porous metal to permit circulation of heated air and to facilitate drying operations. When the moisture content is reduced to approximately 5 percent, the warm malt is transferred from the kiln to storage bins. After moderate aging at this point it is ready for brewing purposes.

At one time, almost every brewery had its own malt house. Today, practically all of the malt used in the U. S. is produced by large commercial malt

(Continued on page 206)



New Bread-Shipping Basket

ALUMINUM shipping baskets for loaves of bread are now replacing wooden slatted and wood fiber ones at Kroger Co., Cincinnati, Ohio. These new baskets are light in weight, durable, easy to nest and stack, and are sanitary.

The first 12,000 of the two-layer baskets, each of which holds 16 of the 20-oz. loaves, have already been delivered. And additional baskets are now being manufactured to fill a second purchase order.

These baskets have recently been developed through the combined efforts of the Kroger Co. and the Republic Stamping & Enameling Co., Canton, Ohio. And they will be manufactured for use by other bakeries.

The body of the basket comprises five pieces of 0.04 thick 52-S-¼-H aluminum alloy. Side and panel ends are embossed with the bakery's name. In the bottom panel are formed ribs for reinforcement.

How They Are Constructed

Since the baskets are constructed for easy steam-cleaning and washing, special runners were required which likewise could withstand such treatments without warping. This was achieved with a wooden runner which was pressure-impregnated with a synthetic resin manufactured by Koppers Co., Pittsburgh, Pa. The new unit is lighter in weight than a metal runner of similar size. It will also outwear the metal kind.

Each basket is put together with 89 rivets—80 of aluminum plus 9 steel ones used to fasten the three wooden runners to the bottom.

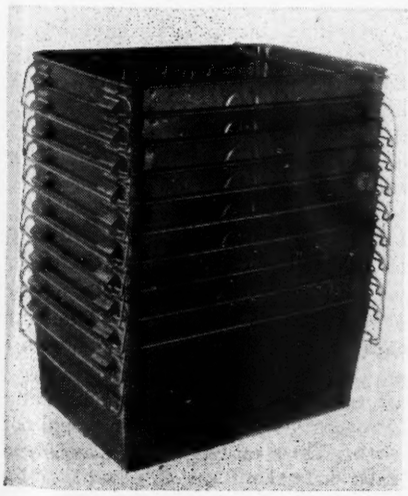
The basket weighs 9 lb., which is 5 lb. less than the wooden slatted type. The inside of the basket is 11¼ in. deep and 25 in. x 16½ in. at the bottom.

Top edges of all four sides are beaded on a cadmium plated steel spring wire, while a hinge, which also serves as a nesting stop, is made of 61-SW aluminum alloy, 0.051 thick. The nesting stop prevents the baskets from sticking together when they are nested empty. When loaded, the handles are turned up on top to serve as bars upon which the baskets can be stacked.

In another development, the basket manufacturer will soon have on the market a single-layer bread basket. Moreover, use of these lightweight baskets will be extended to other foods. For example, work is underway on a similar carrier for bananas, and a basket is being built as a materials handling aid for clerks in stores.

The aluminum basket costs about $5.60, whereas fiber or wooden baskets usually sell for $4.00 to $5.00. But though initial cost is thus slightly higher, life of the new baskets is expected to be 50 percent longer than that of the former units. Moreover, the aluminum baskets can be cleaned and washed without shortening their life.

Because their general appearance accents neatness, the new baskets have high sales appeal. In addition, the name of the bakery can be embossed on the sides and ends of the new baskets, thus adding advertising value.



Nests Easily . . .

. . . Stacks Easily

While chassis waits, body is carried into plant for unloading of empties . . .

Truck Bodies Get A Lift

An efficient bottle filling operation would be stymied were it not for

A MODERN production line and an unusual materials handling operation are tied in with efficient use of a demountable truck body system at the Vernor ginger ale plant, in Detroit. The whole arrangement results in an easy, economical movement of bottles, from their return as empties to their departure refilled.

The principal feature of the method is the transfer of the truck bodies directly from the street to the end of the plant's case conveyor system. In this way it is possible to remove a 70-case load of empty ginger ale bottles and reload a like number of filled bottles in an average of three minutes. First installed by the James Vernor Co. in 1918, this system has been in continuous use ever since.

Entirely aside from its present day efficiency in competition with pallets and fork lift trucks, the system has a most interesting history and one which has enabled the Vernor company to grow into one of the largest soft drink businesses in the country.

It began in 1896 when the present president of the company, James Vernor, then 19 years old, persuaded his father, the late James Vernor, Michigan's first registered pharmacist, to join him in setting up a beverage business at the foot of Woodward Ave., Detroit's main thoroughfare. They used a secret formula from which the elder Vernor had been making ginger ale for sale in his drug store for 30 years.

As the business prospered, the Vernor plant grew upward, instead of outward, into a square block of six and ten story buildings with the main frontage on Woodward Ave. The company was hemmed in on the other three sides by narrow streets dense with horse-wagon and later automotive traffic.

By 1918, the business had grown to such proportions that the company was beginning to have great difficulty in getting the volume of ginger ale out of the plant and onto the company's trucks. Something had to be done, or further growth would have been impossible.

"INSIDE" STORY

Earlier this year (p. 107, Mar. FOOD INDUSTRIES) we pictured an unusual materials handling operation—the use of a demountable truck body for handling soft drink beverage cases. In view of the rapid increase which is taking place in the cost of distributing non-alcoholic beverages, the editors felt that readers would welcome additional details on any procedure likely to lower unit handling cost. This article shows the arrangements, inside the plant, which make the use of the detachable body possible.

Horizontal expansion of the Vernor plant was out of the question because of its location. The narrow side streets and the higher buildings on the adjacent property eliminated consideration of extensive truck loading docks, storage rooms at ground level, or ramps for driving trucks to upper floors.

The system as worked out utilizes conveyors, which move the company's products to and from the ground and upper floors, and a type of demountable truck body that can be lifted off the truck chassis with a load of empty bottles and lowered onto the same chassis with a load of full bottles. The lifting of the truck bodies with either empty or full bottles is accomplished by means of an electric hoist suspended from a carriage. The carriage and hoist move along an overhead I beam, extending from 50 ft. inside the building to a point just beyond the sidewalk curb on the street outside.

In fact, by means of the overhead I beam, the bodies are not lifted off or lowered onto the truck chassis inside the building at all, but outside on the street, with the truck chassis standing close to and parallel with the sidewalk curb.

In the beginning, the truck manufacturers insisted the system would not work. They said the bodies could be lifted on and off the chassis all right, but they could not be kept in place while the trucks were in motion.

. . . to be replaced by another body loaded with filled ginger ale bottles

Right To Production Line

the resourceful use of demountable bodies hoisted right into the plant

Experience has proved, however, that the bodies could be kept in place and for the past 30 years, the trucks have run millions of miles every year without a body every having jumped off a chassis while in motion. In fact, some of the frameworks on the truck chassis for holding the bodies in place are the same as those originally installed in 1918, except for four safety guards—pieces of metal each about 5 in. long mounted on the sides of the framework and bent upward slightly.

When an old truck is scrapped or traded-in, the body-holding framework is removed and placed on the new chassis. The bodies, too, have retained their original specifications through the years. Some of them have outlived several chassis. About 20 extra bodies are kept on hand for the repair and repainting of those in service.

The production flow line and delivery system are closely synchronized. They begin on the fourth floor, where two sizes of cases are stored, one for 8 oz. bottles and one for 24 oz. bottles.

"Showcase" Operation

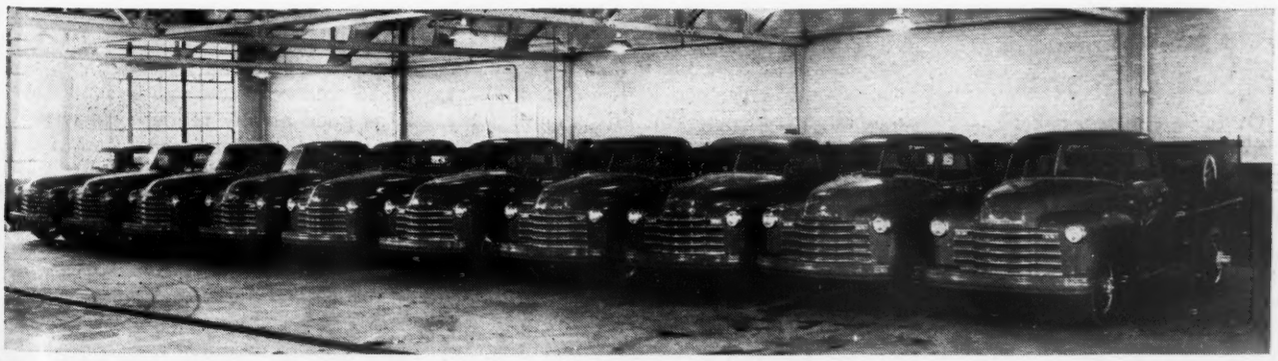
The cases are conveyed to inspection points on the third floor and then move again by conveyor to the second floor. Here they are met by two lines of 8 oz. and 24 oz. bottles filled on the ground floor behind a plate glass window on Woodward Ave. Through this window, incidentally, the entire bottling operation and movement on bottle escalators to the second floor are visible to pedestrians on the sidewalk.

The loaded cases then pass on conveyors to the building on the opposite corner of the block and down to the ground floor loading room. The two conveyors end at the same point, one above the other. One man standing at this location swings the desired number of cases from each line to the truck body being loaded.

To speed up the loading operation by reducing the physical fatigue of the loader, the end point of the heavier 24-oz. bottle case conveyor is higher than the truck body being loaded. The 8 oz. line end point, immediately below the 24 oz. line, requires a lift of only a few inches.

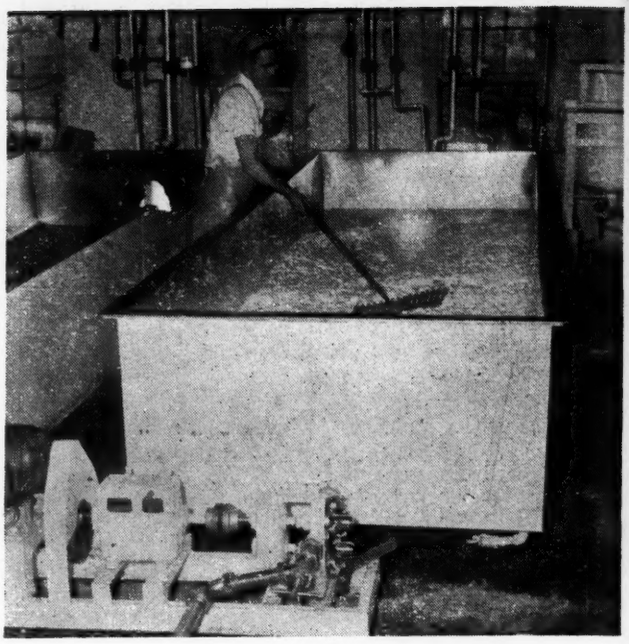
Each body is loaded to make up a delivery route from order sheets, prepared in advance. A tally sheet giving the route number and the contents of the load is hung on one corner of the body. In each case, the body is carried on a low-wheeled dolly, which is first pushed away from the end of the load-

(*Continued on page* 214)



NEW 1-ton trucks, put in service this year, use same frame design for holding demountable bodies that was used 30-yr. ago.

Important factors in soft fresh cheese making are good skim milk of solids-not-fat content above 8.9 percent, and ample acid in the whey. Present law, prohibiting addition of extra milk solids to low casein skim, eliminates acid method in many cases, making use of rennet necessary. In view of this changed situation, the cheese maker will do well to consider these—



Cheese is Creamed and Smoothed . . .

Tips For Improving Acid-Type Fresh Cheeses

BY ERIK LUNDSTEDT
Production Manager Sante Foods, Inc., Goshen, N. Y.

Photos by C. Zaimes, Goshen, N. Y.

SOFT fresh cheeses should be made by the acid method without the use of rennet when a good grade of skim milk of a high solids-not-fat content is available.

But, if the milk has a low casein content and cannot be standardized with extra solids, rennet must be used and the curd cut at a lower acidity.

In view of the great increase in soft cheese consumption, let us examine modern methods of manufacture and consider ways of improving product quality. Three principal soft-cheese types will be discussed, namely: Bakers, flake or popcorn, and creamed cottage cheese.

Bakers Cheese Difficult

Of these cheeses, bakers is considered by many cheese makers to be the most difficult. It is a dry, smooth, doughy, rennet-type cottage cheese that should be silky and smooth in the mouth. When kneaded in the hand it should be like a non-sticky bread dough. The yield is about 13 lb. to 100 lb. skim milk and the moisture content about 75 percent.

Graininess is the most common complaint about this cheese—a graininess or grittiness that will not permit absorption of additional milk when used for cheese cake. This is due to lack of acidity in the milk before filling the bakers cheese bags.

Many cheese makers think it is the fault of the rennet. But regardless of the amount of rennet used, this cheese will never be smooth and silky if the acidity has not gone beyond the iso-electric point of the para-casein—that is 0.6 percent acid or better in the whey, corresponding to a pH around 4.4. The curd should have a certain firmness for proper draining. The amount of rennet to use (1:15,000) should not be more than 10 ppm. or about 4½ cc. per 1,000 lb. of milk at 70 deg. F., and half this amount if the cheese is set at 88 deg.

Another complaint about bakers cheese is high color from remaining whey. We know that whey contains about 1.2 to 1.4 ppm. of riboflavin. This vitamin gives the yellowish greenish cast to the whey and the cheese. By leaving the curd bags in cold water, or having a sprinkler system arranged over the bags, this color can be washed out leaving the resulting cheese white.

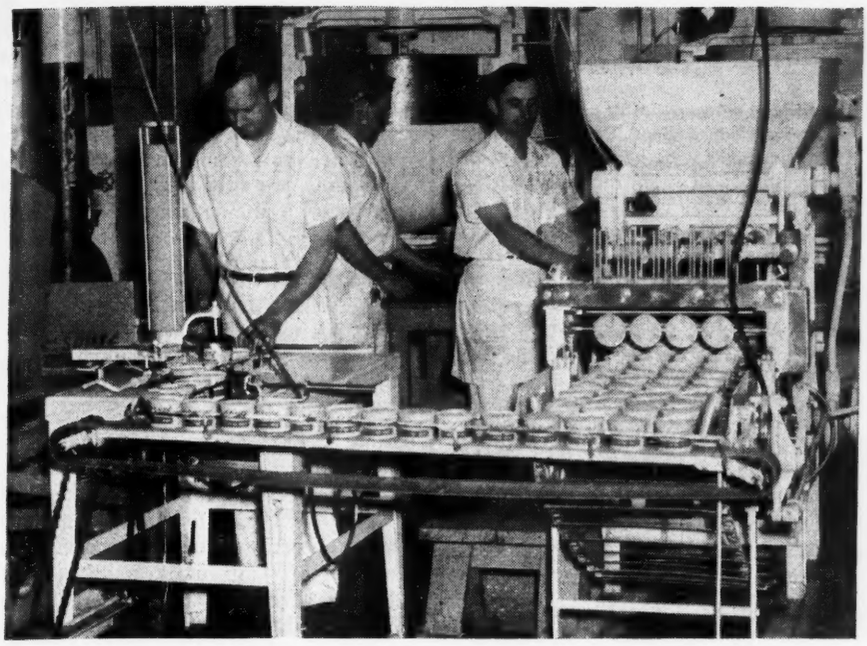
The next most difficult cheese to make right is flake cottage cheese, also called "popcorn" style or "cubed" cottage cheese.

With a good grade of skim milk of a solids-not-fat content of 8.9 percent, corresponding to 2.5 percent casein, there is no difficulty in making a smooth, sweet, large flaked cottage cheese without the use of rennet. Note the relation of casein and solids in fat-free skim to fat in the original milk.

Fat in Whole Milk (Percent)	Casein in Fat-Free Skim (Percent)	Solids in Fat-Free Skim (Percent)
3.0	2.2	8.5
3.5	2.4	8.8
4.0	2.6	9.0
4.5	2.8	9.3
5.0	3.0	9.6

As long as the milk has set to a good curd, even if the acidity in the whey is 0.6 percent, a perfectly sweet, uniformly flaked cottage cheese can be made that is as good as any rennet type cheese. But if the milk is poor, has a low casein content, or becomes gassy at high acidities, a decent flake cheese cannot be made by the acid method alone. The only remedy for this condition is a small amount of rennet and cutting the curd at a lower acidity.

This method has worked its way back over the country from California and is accepted by many as the best



. . . Then Automatically Packaged and Capped

way to make a uniform cheese with various kinds of milk. It is going to be forced upon us by reason of competition, and by consumer demand in the event that the milk available is of such physical or bacteriological qualities that flake cheese cannot be made by the acid method alone.

This condition is undoubtedly due to four factors: (1) Low-fat, low-solids milk which was brought on by: (a) Payments of subsidies on quantities rather than nutritional qualities including fat; (b) high feed costs, and (c) no provisions in 37 states for standardization of market milk, with the farmer being the beneficiary on the fat differential; (2) increased mechanization of dairy farms during the last decade brought about by difficulties in obtaining labor, and the subsequent increased sanitation problems classified under the general term thermoduric bacteria; (3) pasteurization of all milk for the manufacture of soft cheeses, and (4) federal and state laws permitting not more than 80 percent moisture in uncreamed cottage cheese.

Use of Rennet

The pioneering work done by our universities and colleges, and representatives of cottage cheese coagulator firms, has had a profound influence on the handling of rennet type cottage cheese. In other words, low-solid skim milk with a casein content of 2.4 percent and lower is not suitable for flake cheese manufacture by the acid method alone. If the milk, regardless of solids or casein, has a high incidence of thermoduric bacteria, it usually becomes a slow milk for the starter bacteria and a gassy milk. Such milk is very difficult to handle and should be set at low temperatures by the rennet method.

If, for any reason, pasteurizing of the skim milk brings about a denaturing or flocculation of the albumen, the resulting cheese is very difficult to cook. It may shatter if made by the acid method.

There are, of course, many other reasons why it is impossible to make a good flake cheese by the acid method —such as slow starter; milk from diseased cows; abrupt changes in weather, especially in the spring and fall; and changing from stable to pasture. It is noted that the first frost hitting the pasture in the fall brings about changes in the milk that retard the growth of the starter bactera. If we have mastitis conditions, with low phosphorus and calcium in the milk, together with high chlorine, no satisfactory cheese can be made from it.

If we have a bacteriophage infection of the equipment, we may have to wait two days before the milk will set. We do not know where this bacteriophage originates nor do we know about its metabolism, although it can be detected in the incredibly small amount of one part per quadrillion. There is only one remedy for this infection: Heavy chlorination of the entire plant, including tank trucks and cans. Quaternary ammonium compounds will not alleviate this situation.

Limitations on Rennet

The question of when to use rennet has been discussed at length, but one very important consideration has not been mentioned—the human factor.

If for any reason your plant layout or schedule is such that a cheesemaker is not present when the vat is ready to be cut—do not use rennet. If your cheesemaker believes the old adage that if 1 cc. of rennet is good, 2 cc. ought to be better—then get another cheesemaker or do not use rennet.

The introduction of rennet is a headache to people who do not understand the action of this enzyme on the casein in milk. For this reason, it will be necessary to discuss coagulators in detail.

Rennet is a brine extract of the fourth stomach of the suckling calf. Commercial rennet extracts contain something like 10 percent salt, 4 percent boric acid, and 0.3 percent of the active enzyme—rennet. The pH of this extract is about 6, and its average strength 1:15,000.

In the aging process before the rennet extract is sold, it may lose 30 percent of its strength during the first three months and thereafter 1 percent per month, and much more on exposure to sunlight or storage in a warm room. We may, therefore, expect to have rennet in our creameries with strengths varying from 18,000 to 10,000 and less. In other words, if the cheeses are standardized with 1:18,000 rennet which deteriorates to 1:9,000, we will have to use twice as much to obtain the same result. It is claimed that one part of pure rennet enzyme will coagulate more than 7.6 million parts of milk. By the handling of the curd a practical cheese maker can detect one part of the pure enzyme in rennet extract (0.2 percent) in 500 million parts of milk.

For cottage cheese, the maximum amount of rennet to be used is 2 ppm., or less than 1 cc. per 1,000 lb. of milk. This amount should be used only if the milk is set at 70 deg. F. For average cottage cheese making 1 ppm. or 4½ cc. rennet per 10,000 lb. of milk is sufficient. It will give the best results in conjunction with 100 ppm. of calcium chloride or 1 lb. of $CaCl_2$ per 10,000 lb. of milk.

Cottage Cheese Coagulators

When the so-called cottage cheese coagulators appeared on the market expert cheesemakers, and representatives from the firms making these coagulators, traveled from place to place demonstrating how to make a good piece of flake cottage cheese. The firms went to great expense in educating cottage cheese makers. Their demonstrations were free, their expenses being covered by sale of coagulators at $20 a gallon.

An analysis of these coagulators showed that they did contain about 2 oz. of rennet (1:15,000) and a little more than ½ oz. of a 7 percent pepsin (1:3,000) solution per gallon—the rest of the ingredients we can forget. The main warning was to use no more than

Consumption—And Production Problems—Up

Total production of soft cheeses in the United States in 1920 was approximately 40,000,000 lb., of which one third was cottage cheese. Today, about 70,000,000 lb. of cream cheeses and 250,000,000 lb. of cottage cheeses are produced.

This great increase in production was brought about by: (1) Improved transportation, (2) wider distribution, (3) better refrigeration and convenient store service to the consumer, and (4) persistent educational advertising by government bureaus, colleges and the industry as a whole. In all parts of the country, signs point to ever increasing demand for this type of cheese.

The industry, however, is faced with a difficult manufacturing problem as the result of Federal Food, Drug & Cosmetic Act standards that prohibit the use of concentrated or dried milk products in cream or cottage cheeses. This necessitates the more general use of rennet, especially where the available skim milk is of low casein content. It also requires the freezing of curd during the flush season in order to meet the demand for cottage cheeses when milk supplies are short.

In this article, the author, one of America's outstanding soft cheese authorities, discusses the use of rennet, the freezing of cheese curd and the manufacture of soft fresh cheeses by the acid method—*The Editors.*

1 oz. per 1,000 lb. of milk, which is equivalent in renneting strength to 0.7 cc. The recommended amount of cottage cheese coagulator was 22 cc. per 1,000 lb. of milk or the equivalent of ½ cc. of rennet extract.

It is easy for a cheesemaker to make his own coagulator if he so desires. To a gallon jug add 64 cc. of 1:15,000 rennet extract of commerce and 18 cc. of a 7 percent (1:3,000 digesting strength) pepsin solution and fill the bottle with a 10 percent salt solution containing 4 percent boric acid. Pepsin is not to be recommended however, since it produces bitter cheeses through the breakdown of the para-casein to the bitter tasting peptones. It is therefore much simpler, and legal, to use ½ cc. of rennet extract per 1,000 lb. of milk.

The flake or popcorn feature has been stressed because it is important to have uniform size flakes during the cooking. This prevents overheating of smaller particles with resulting graininess and dusty cheese. It holds true whether or not the cheese is to be merchandised as a California or "popcorn" style, or as the soft, smooth, and heavy bodied New York style of creamed cottage cheese.

Making Popcorn Cheese

No flake cheese can be made if the cheesemaker insists on paddling in the vat. If he will leave the cheese vat alone for the first hour after the vat is cut, he stands a much better chance of making a flake cheese. For the next hour, when the steam is turned on in the water filled jacket, the cheese should be stirred for only a few minutes every 10 min. After that time, the curd particles should float independently and be firm enough to resist breaking.

At this point the true art of cheesemaking comes to the fore. The exact point at which the hot whey shall be drained from the curd determines the quality and consistency of the finished product. If the vat is drained too soon the cheese will be mushy and sometimes impossible to drain. Moisture in the finished product will be more than 80 percent. If the vat is drained too late a hard rubbery curd may result.

The ideal finished curd, both rennet and acid type, is one which is lively and firm, but will crush to a smooth texture when pressed between the tongue and the roof of the mouth.

The average yield from 100 lb. skim milk including starter, in New York State, is about 15½ lb. with 80 percent moisture and less. If creamed with 15 percent cream the yield of the finished creamed cottage cheese will be 21½ lb. with 4.2 percent fat and 79 percent moisture.

Creamed Cottage Cheese

Since all creamed curd for New York City is smoothened by grinding or mixing before packaging, it is very important to know how such a curd should be handled. Before the era of the moisture and fat standards, the curd was made so wet and soft that after creaming with 40 percent cream no particular mixing machine was necessary. But today it is an entirely different story if one desires to be within the law on moisture.

The curd must be made into distinct flakes, of such a consistency that they lend themselves readily to draining after the last cooling with water of 35 to 40 deg. F. By knowing the amount of milk in the vat, the solids not fat and the yield from previous days it is not necessary to weigh the curd for creaming. The cream can be dumped on the curd and mixed by mechanical agitator or forks and then pumped directly into the hoppers of the filling machines.

It used to take 6 men 20 min. to empty a 10,000 lb. cheese vat of creamed cottage cheese (2,100 lb.). Today, a bump pump will handle the same amount in 6 min. with one man. With a stainless steel compression valve in the line, a 1 hp. motor pump will deliver a smooth cheese to the hoppers, provided the cheese is not rubbery. If the so-called Moyno pump is used, no compression valve is necessary.

Skim Milk a Problem

Since the sale of soft cheese does not fluctuate to a great extent during the year it becomes very difficult, if not impossible, for many manufacturers to have adequate supplies of skim milk on hand in the short season.

There is a possibility that the U. S. Food & Drug Administration will again permit the use of concentrated and dried skim milk for the manufacture of cream and cottage cheeses. If allowed, the standardization of milk with additional solids will be a great step forward in the production of better and more uniform cottage cheeses.

Frozen Curd

The present F&DA prohibition of the use of concentrated or dried milk will, for the time being, force many manufacturers to rely on frozen cottage cheese curd in the short season. As upon thawing, this curd is just like sand, its use will be to the great detriment of the industry. Freezing quickly ruins the structure of the casein curd and reduces its ability to hold and absorb moisture. If washed, the cheese sometimes appears as a dusty nondrainable or a grainy hard sandy curd. In order to maintain a firm non-sloppy creamed curd the user of frozen cheese must sacrifice about 15 lb. of moisture per 100 lb. of frozen curd by draining before creaming. I would like to warn any manufacturer who must freeze cottage cheese curd, of the following: 1. Do not use rennet or coagulators—it makes the curd dusty, 2. do not use salt—It makes the curd bitter, 3. do not overcook the curd, make it soft and as near 80 percent moisture as possible—otherwise it will be dusty, and 4. do not freeze curd if it is not perfectly fresh and made of well or even high pasteurized milk of a low bacteria count.

Homogenized Milk Cheese

Another problem with F&DA standards was the omission of homogenized milk as a starting mix for cottage cheese, although it is permitted in the manufacture of cream cheese. The author developed and put into production, 6 years prior to the new law, a standardized, low-pressure homogenized milk for cottage cheese. The temperature of pasteurization and the homogenization pressure were balanced in

(*Continued on page* 218)

EDITORIALS

COMMENT AND OPINIONS

Speed the Standards Hearings

THE procedure for adopting food standards is slow at best, so food processors cannot be blamed if they object to needless delays. After all, the time and expense involved in a prolonged standards hearing easily can become burdensome on the industry involved.

On this score, the recent frozen fruit standards hearing is open to criticism. Some in the industry feel that the many controversial elements introduced by representatives of the sugar industry extended the hearing beyond a reasonable time. And it is questionable whether the issue involved justified the procedure followed.

This is not the only hearing in which a prolonged sweetener controversy has caused delay. But people in the food industry wish it were the last, and they would be happy if corrective measures were taken by the government and the sweetener manufacturers.

Had it been considered feasible to set up standards of identity for ingredients at the outset of the food standards program, then so much time would not be taken up in discussing ingredients at hearings involving fabricated foods. But that is water over the dam. Now the government should survey other possibilities and see what can be done. It would help if the Commissioner and his senior staff could obtain a stipulation from the sucrose and dextrose industries as to what they agree upon. This at least would narrow the range of controversial elements.

In future standards hearings, the sweetener issue should be limited to a simple review of facts, supplemented by brief argument over new information peculiarly pertinent to the specific commodity under study.

We must have standards for many foods. But we cannot ask processors to bear the needless expense involved in unduly protracted hearings.

Improve Packaging Machines

HAS packaging-machine design kept pace with mechanical progress? That is a question which should be considered carefully by the designers and builders of packaging equipment.

We recently heard an operating executive of a leading food plant cuss out packaging equipment in general: "It is years behind the times. There are too d—— many reciprocating parts. The machines wear too rapidly, are always getting out of adjustment, require too much maintenance, need too many operators and take up too much floor space. They are a bottleneck in high-speed continuous operations."

Outside of these observations, the executive's only concern was that there was no equipment available which would rapidly stack a fragile product of varying dimensions.

In the average food plant, packaging costs are a relatively high proportion of production costs. As in materials handling, worthwhile savings can be made by increasing efficiency. And herein lies an opportunity for packaging machine builders.

We particularly go along with the observation that the average packaging machine has too many reciprocating parts. Every mechanical engineer knows that rotary motion is basically better than reciprocating motion. It permits higher speeds, requires less power, makes less noise, curtails wear, minimizes adjustments and reduces damage to the material handled. Can't it be employed to a greater extent in packaging machinery?

Another feature of package machine design which saves production-line time is a replaceable subassembly of the unit which experiences the most wear and tear and therefore requires the most maintenance. Such a subassembly can be replaced quickly with a spare to minimize down-time.

Packaging machine manufacturers have made a lot of improvements in their equipment. In fact, some machines seem well-nigh perfect. But in general much still can be done. And if the designers don't meet the constantly increasing requirements of the plant production line, some of the smart machine tool builders might come into the picture. Those people can make a machine do practically anything.

Browning Inhibitor Unsafe

RESEARCH studies made in Palestine and reported in this country indicate that thiourea and allylthiourea are effective in preventing the darkening of banana slices during dehydration. This calls for a warning to food technologists who might be contemplating the use of these darkening inhibitors.

Thiourea and allythiourea are goitrogens, and their use in foods for human consumption certainly cannot be recommended, even if they prevent browning completely. As little as 25 to 50 milligrams a day is said to keep down thyroid activity in hyperthyroid conditions. And the hazard of the compounds is increased by the fact that some plants grown in the soils of certain areas contain enough of the compounds to act as thyroid depressants in individual cases. It would not be safe to aggravate this situation by artificially adding to the "dosage".

Evidence to the effect of thiourea compounds also is found in the fact that they have been used in animal feeds as thyroid depressants to permit rapid weight gain.

So if you have a browning problem, we suggest that you find some other solution to it besides the use of thiourea compounds.

No Part-time Job

Is the food technologist to be employed in the role of a "fireman", to be called in only on occasions when there is a "fire" to extinguish? Or is he someone who should be employed regularly?

Should he be paid only to cure industrial troubles, or should he be paid to keep the food industry well?

Is food technology an activity that a food company can don at will, and then toss aside for by-guess-and-by-gosh methods?

You know where we stand. But for the benefit of

latecomers let it be restated that the food technologist should be a full-time employee. What his title may be is unimportant. What he does is all important.

In our opinion, he should ultimately reach the top of the production department, with the laboratory only a stepping stone in his path of progress.

There are, however, some in industry who seem to think their businesses can get along without competent technical direction. They call in a food technologist only when trouble develops. This policy is all wrong.

A competent food technologist recently rebelled at further service as a "fireman." This causes us to applaud and chortle. One with super acute hearing might even detect a sneering sound.

The manufacturer's relations with food technology are continuous. So his relations with the technologist also should be continuous—not intermittent. The latter is the route to trouble.

Polluters Disciplined

WITHOUT waiting for the functioning of the new Federal Water Pollution Control Act, a number of states and municipalities have cracked down on food and chemical plants which have dumped waste materials into sewers and waterways.

One of the hottest spots is Elwood, Ind. There, the city authorities blocked the sewers from three of the city's largest food-processing plants. The local disposal facilities could not handle the huge volume of wastes previously dumped into the sewers at the peak of summer activity.

It looks as though many processors will have to find some way of converting effluent components into by-products, even when this is not initially profitable.

Fuel Values Changing

RELATIVE costs of B.t.u.'s from different fuels have shifted importantly in the last few years. A study by an industrial consultant revealed that natural gas was cheaper than coal or oil in 11 of 24 cities where figures were available; coal was cheaper than natural gas and oil in 13 of the 24, and oil was cheaper than natural gas in 6 of 34 cities.

Convenience and suitability to the process sometimes outweigh a cost advantage in fuel selection. Certainly reliability of supply is an important consideration. These factors usually are self-evident, but relative cost per million B.t.u. is obscured by price per ton, or gallon, or thousand cubic feet and should be investigated in these times of changing values.

Much Needed Amendment

FOR nearly two years, food defiled by rodents or insects while stored after interstate shipment could not be seized by the Food & Drug Administration. Because of ill-advised decisions by federal courts, these filthy products could be taken out of circulation only when contamination had occurred before or during shipment. This is an example of a hair-splitting court ruling which rated the "whereas" of the law more important than the welfare of the public.

Both the food industry and the consumer should be thankful for the Miller Amendment to the Federal Food, Drug & Cosmetic Act. It corrects an intolerable situation.

If there was ever any doubt that the Miller Amendment was needed, it was erased quickly by F&DA. More than 32 tons of unfit food in storage warehouses were seized every working day for six weeks after the President signed the amendment. Much of the condemned material was cereals and other foods attractive to rodents and insects. But canned and frozen products that had deteriorated after shipment also were seized.

Better quality control at the warehouse level has been needed. Now it becomes a must.

Radio-Isotopes in Research

CAN radioactive isotopes be used to discover new facts in the field of food technology? In view of their application in other sciences, it would seem that they could.

The medical profession has pioneered in the effective application of tracers in biological research. Horticulturists, too, are finding out things they never knew before with the aid of tracers. They have studied the mechanism by which plants produce food from carbon dioxide, water and nutrients by photosynthesis. Workers at the University of Wisconsin recently employed tracers to study the process by which legumes convert nitrogen of the air into a form which can be used by plants.

It is indicated that another horticultural problem could be solved easily by tracers. It is the question as to whether fertilizer feeds a plant directly or only through the medium of the soil. The way to find out is to apply fertilizer which includes a pinch of, say, radio-phosphorus. If the plant becomes radioactive, it drew from the fertilizer; if not, it drew from the soil.

Metallurgists have employed tracers to determine how undesirable sulphur gets into steel. The tracers also have been utilized in determining the concentration of toxic fumes in industrial plants; in measuring the lubricant applied to textile fibers in amounts so small that ordinary measurements fail; and in determining the minute amount of metal transferred when a shaft rotates in a bearing.

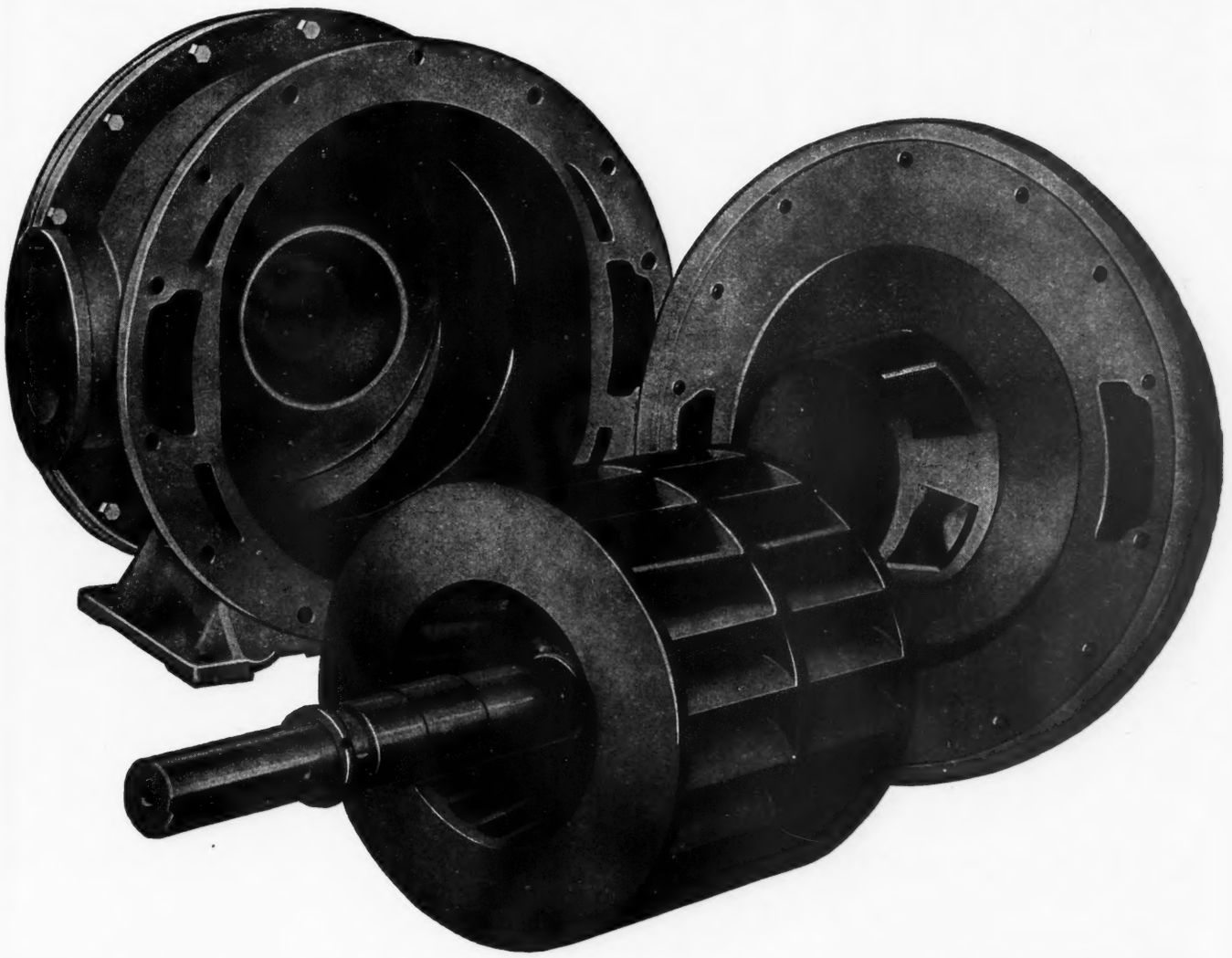
Use of tracers to control industrial processes is being considered. As an example, radioactive phosphorus added to a Bessemer steel furnace would show when the last impurity, usually phosphorus, has been removed from the steel. In rayon manufacture, radioactive sulphur would make it easy to determine whether complete removal of sulphur is achieved in the desulphurizing bath.

Research with tracers is characterized by directness and simplicity. Often the experiment can be run in large-scale equipment. This is important, because there is sometimes serious doubt as to whether a conclusion reached in the laboratory will hold in the plant itself.

One reason for the current widespread interest in radioactive tracers as research tools is the relative low cost of tracers from the atomic pile. The radio-sulphur used in a research study on steel cost about $50. It would have cost thousands of dollars prewar.

Because radio-isotopes are so effective in studying a complex chemical phenomenon, they well may become a useful new research tool for the food technologist.

Only *Nash Vacuum Pumps* have all of these advantages



Nash Vacuum Pumps are simple, having but one moving part. These pumps have unusual characteristics. They will handle a gas and a liquid simultaneously. Slugs of liquid entering a Nash Vacuum Pump do no harm. Thousands are rendering service where this condition is present.

A unique feature of Nash Vacuum Pumps is that, in handling hot and saturated vapors, they have a condensing effect . . . The operating principle involves an internal liquid seal, which condenses and contracts hot vapors and gases . . . Unless the amount of hot vapor is great, other condensing devices are not necessary.

This liquid seal may be varied with the gas being pumped. On solvent work the percentage of recovery may be increased by using a suitable liquid as the pump seal and recirculating this liquid. Because of the complete lack of internal lubrication, the solvent cannot become contaminated.

Nash Vacuum Pumps are furnished in a wide range of capacities up to 5,000 cubic feet per minute. In single stage design they efficiently maintain vacuums up to 27 inches of mercury, and in two stage design vacuums above 29 inches.

THE NASH ENGINEERING COMPANY

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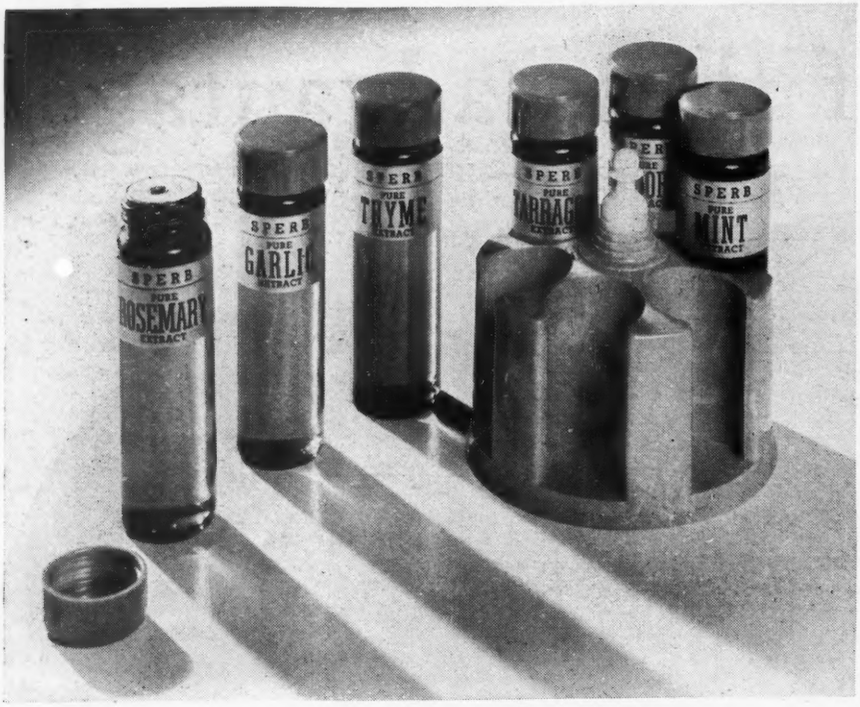
NEW PACKAGES & PRODUCTS



Liquid Spice and Herb Sets in Spill-Proof Bottles

FLAVORING EXTRACTS for the housewife's convenient use are being offered by the Favorite Flavors Co., N. Y. C. The products are packed under the tradename Sperb in 1-oz. glass containers which seat snugly in a plastic "poker-chip"-type holder.

Cork plugs with small tubes through the center are inserted in the openings of the individual bottles. A shake of the container lets air in and the contents out.

Green plastic caps, which screw tightly onto each bottle, contrast colorfully with the holder, which comes in green, walnut, ivory or marble shades.

Two sets of six different extracts are available. The spice set consists of: Allspice, anise, celery, cinnamon, ginger, and nutmeg. The herb set: Rosemary, garlic, thyme, tarragon, marjoram, and mint. At present distribution is limited to the New York City area.

New General Foods Product

INSTANT CAKE MIX is the latest member of the Swans Down family of the General Foods line. The 1-lb. package contains enough ingredients for two 8-in. layers, a 10 x 5 x 3-in. loaf, a 9 x 9 x 2-in. square, five dozen cookies, or from 16 to 24 cupcakes.

Following the trend to make the housewife's work easier, the basic white cake is made by merely adding milk to the contents of the package. It takes only four minutes from box to oven. Complete recipes for various other delicacies are enclosed in each box.

This new cake mix is made with Swans Down flour. It has been extensively tested in markets east of the Ohio river, where it has found popular acceptance. As production increases, distribution will be extended nationally.

Convenient Meats For Baby

STRAINED and chopped meats for babies, produced by Gerber Products and Armour & Co., are now distributed on a nationwide scale. Having been tested in over 40 markets, favorable acceptance has encouraged production to be increased.

Both products are packed in 3½ oz. cans. Labels were designed by Raymond Loewy and feature the Gerber baby and the Armour Star trademark. The strained meat cans are in blue and white, and the junior meats in red and white. Each can holds several servings.

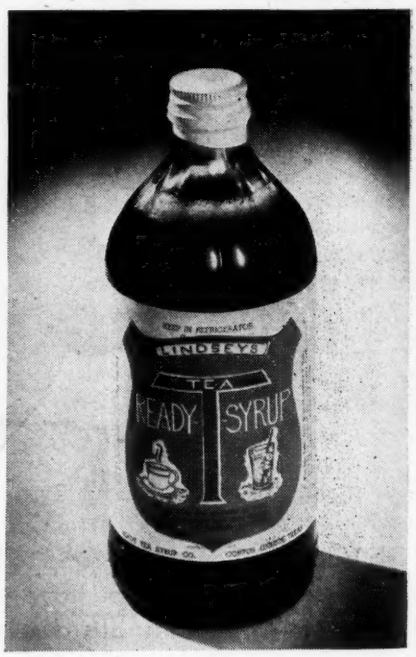
Poi in a New Look

TARO ROOT, better known as poi, has outgrown its native dish status and is now an accepted staple Hawaiian food. Until recently, however, the food has been sold in cloth bags. Marketing specialists of the U. of Hawaii College of Agriculture have been experimenting, in conjunction with the poi millers, with various packaging materials.

One of the more successful packages developed so far in this study is a Pliofilm bag supplied by the Shellmar Products Corp., Mount Vernon, Ohio. An unusually large taro crop was marketed this year, and widespread consumer acceptance of the new bag throughout the islands is being credited as a major factor.

Iced Tea With Ease

SIRUP PRODUCED by Lindsey's Ready Tea Syrup Co., Corpus Christi, Tex., has made the preparation of iced or hot tea the simplest of culinary chores. The prod-



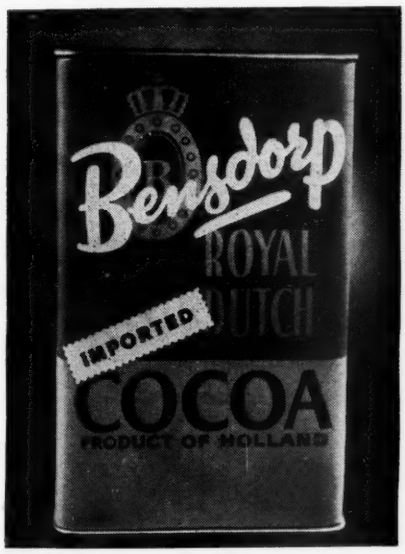
uct, available in 16-oz. bottles, is a mixture comprising a brew of choice teas with corn and cane sugars. Adding two tablespoons of tea sirup to iced or boiling water for a 12-ounce glass makes the drink of one's choice, for approximately 2 c. a glass without the trouble of cleaning the kettle.

The manufacturing process grew out of a housewife's desire to prevent waste of undissolved sugar or unused tea. Having tested the product with considerable success in the Corpus Christi market for the past season, the company plans future expansion of manufacturing and merchandising facilities.

Bar Harbor's Latest Seafood Product

MAINE SARDINES are now being packed in both tomato and mustard sauces by the North Atlantic Packing Co., Bar Harbor, Me. Heretofore, the pack has been exclusively in oil.

The processor has changed from the old-fashioned square cans with the opening key. Now used are 8- and 15-oz. oval, gold-lacquered type cans supplied by the American Can Co. The label, of red, white and blue, is made by the Murison Label Co., Brooklyn.



Bensdorp Repackages

ROYAL DUTCH COCOA and chocolate, imported from Holland and packed by the Bensdorp Importers, Inc., of Boston, has undergone a complete change in packaging. With discard of the traditional and adoption of the modern design, the Royal Crest, which has identified the products for over 100 yr., is the only distinctive mark retained on the new can.

Jim Nash designed the container with the specific aim of reaching the upper-third quality market and commanding a premium price.

Strings of Rock Candy

BACK AGAIN after a wartime absence are specially selected white rock candy strings by Dryden & Palmer, Inc., Long Island City, N. Y. Two full strings, weighing 2½ oz., are packed in a new convenient compact 10c. carton. Twelve of these cartons fit into a self-selling, "twin-style" display box. This container separates into two boxes of six each, for selling at different spots on the counter. The package is particularly adapted for chain grocers, super markets and drug stores.

The carton and display box were designed and supplied by Brooks Bank Note Co. of New York City.

Rock candy has long been recommended as a quick energy food and a pleasant relief for dry, husky throats. It is also an ingredient in the popular rock-and-rye drink.

Whip Topping Repackaged

FROZEN DESSERT TOPPING produced by the Rich Products Corp., Buffalo, N. Y., is now being marketed in a colorful new package. Both retail and institutional-size containers feature a new utilitarian design affording greater accessibility and storing facility.

Polled comments of thousands of Whip Topping users were the guides in repackaging this product. Eye-arresting appeal to the shopper, promotional appeal to the retailer, and convenience to the users were goals of the design. Package now measures up to the taste-appeal of the product.

PHILADELPHIA
MACARONI CO.

ANOTHER
SATISFIED USER OF
Paksure
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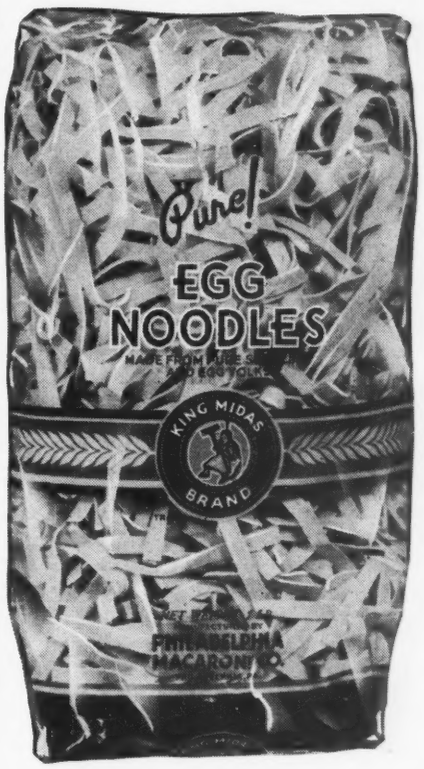

Yes, Philadelphia Macaroni Co., Well-known producer of macaroni products, is another satisfied user of our Paksure food packagings.

We are equipped to design and supply a complete line of packagings for all types of foods . . . from noodles to cheese, from meats to chocolates . . . wrappings, bags, envelopes and boxes, etc. of stock or original design for sure protection and "eye appeal".

For packagings that assure maximum protection, utility and sales appeal, consult "experts of long standing" . . . we'll give your problem prompt attention.

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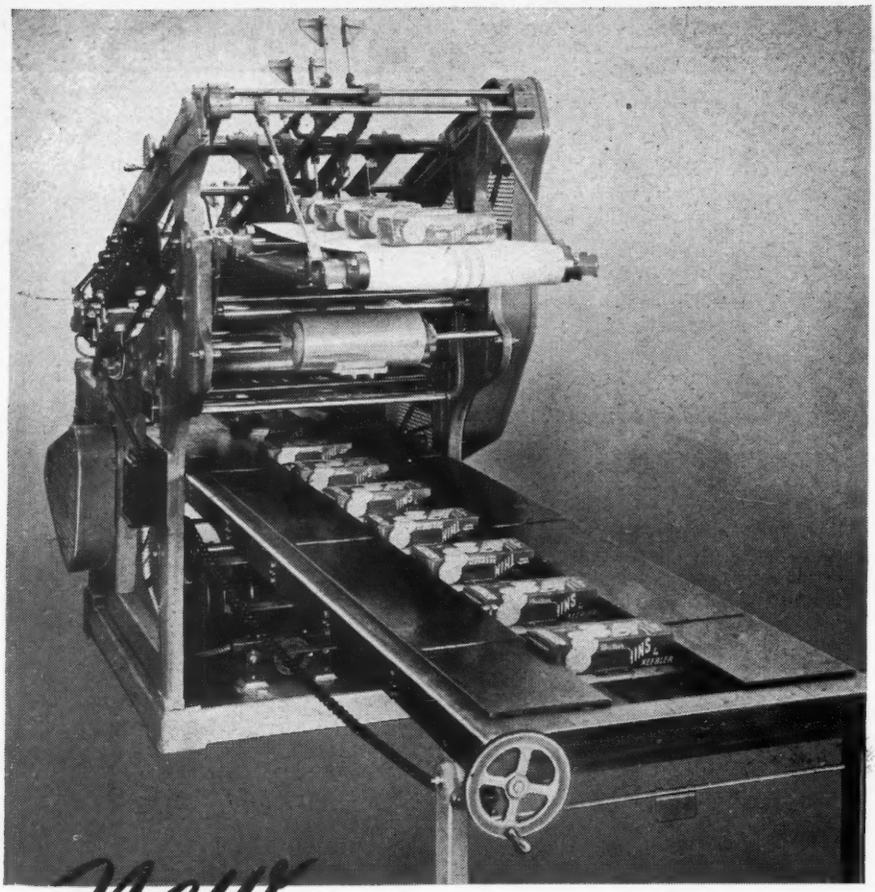

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(MODERATELY PRICED)

Smart, eye-catching wrapping that stands out in competition! . . . Modern machine design that makes for efficient, economical operation. The new Model F offers you both—at a relatively small initial investment.

Wraps cartons, goods in trays, open boats, flat cards, or U-boards at a speed of up to 40 per minute. Only 2 handwheel adjustments are necessary to change over to a new package size. Accommodates products within the following ranges: 3¾" to 16" long, 2½" to 8" wide, and ⅜" to 6" high.

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Our new Thermo-Print-Labeler can also be provided, if desired. Mounted on the discharge conveyor of the machine, this unit *imprints* date, price, code, etc. on a die-cut label, then heat-seals it to the top of the package.

Phone our nearest office for complete information on the new Model F.

Literature on request

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Over a Quarter Billion Packages per day are wrapped on our Machines

Multipurpose Container

PEANUT BUTTER fortified with thiamine to provide extra nutritional value is being introduced by Swift & Co. The product is packed in a 12-oz. glass container capped with a colorful, lug-type plastic top—which has been specially designed for reuse as an iced drink coaster. These covers come in red, amber, natural and cocoa brown colors.

The jar also may be used later as a refrigerator container. The easy-stack feature of the new-cap jar will be of practical value to the food store operator.

Improved Salmon Pack

CANNED salmon with skin and backbone removed is now being packed by the Pacific American Fisheries, Inc. of Bellingham, Wash. Alaska sockeye and chum salmon are used. The cans weigh 7¾-oz. A paper disk pasted on the top of each can states that the process is new and the first great improvement in salmon canning in 25 yrs. The disk also includes a request for the user to write to the processor and give an opinion of the new-type delicacy. Although no premiums are offered, the company reports the replies have been exceptionally good.

Improve it with Monsanto Phosphoric Acid and Phosphates

Whether you make soft drinks, jellies, preserves, baking powder, self-rising flours, prepared flours or use mineral supplements in your processing—there's always the possibility that Monsanto phosphoric acid and phosphates can help you make your product better. Their uniformity and high purity have long contributed much to many divisions of the food industry.

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New Mix for Northwest

A PANCAKE MIX in a new package has been introduced by the Fisher Flouring Mills Co. of Seattle. The box holds 2 lb. of mix, composed of wheat flour, shortening, non-fat dry milk solids, dry buttermilk, sugar, salt and baking powder.

The package, designed by James Allan of Pacific National Advertising Agency, features golden pancakes standing out against a deep blue background, with the name "Fisher's" on a round red spot. The back of the wrapper has directions for preparation.

Vegetarian Foods

MEATLESS "steaks" and "skallops" are now being packed and distributed by the Battle Creek Food Co., Battle Creek, Mich. Both products have a wheat gluten base and are particularly produced for consumers who are on a vegetarian or special reducing diet.

Greaseproof Durable Film

WINDOW PACKAGES for fresh frozen chicken have been designed to aid the consumer in selective purchasing. In addition to showing a good portion of the contents at a glance, the transparent film provides a protective covering which is durable at low temperatures.

Developed by Sylvania Division, American Viscose Corp., the cellophane is greaseproof and, when heat-sealed, will "hold in" flavor and moisture.

FOOD INDUSTRY NEWS

Recognize Food Technologists In Emergency Draft Deferments

Will measure the importance of individual and job before calling up younger food scientists for military service

THE FOOD TECHNOLOGIST or researcher, who is more important to the country's welfare in his civilian job will not be drafted into the Army to become just another GI Joe in the next emergency.

That has been made certain by President Truman's Executive Order No. 9988, in which he laid down certain rules and regulations regarding deferments under the new draft law.

The President accepted the recommendations of the National Security Resources Board, the agency charged with planning how to gear the U. S. economy to the demands of the next war. NSRB has been plugging for and arguing the necessity of giving government manpower experts the authority to ration manpower between the civilian and military halves of the U. S.-at-war.

This has now been done—and the decision represents a basic change in the whole approach to wartime manpower problem. During World War II, manpower distribution of a sort was attempted. But deferments for scientists and professionals with much-needed skills were arranged on haphazard, man-by-man or job-by-job bases.

Now the President has the authority to list critical "categories of occupation, employment, or activity essential to the national health, safety, or interest"—and set up regulations governing the deferment of people engaged in such activities.

This means that local draft boards of neighbors and citizens will still have the first decision on whether or not a scientist, who is otherwise eligible for the draft, shall or shall not be taken. But the local board will have instructions for handling specified kinds of scientists. And the important thing is that appeals from a local board's decision on such questions will go to the board of civilian experts who will be independent of the selective service director—and not to a board made up of Army officers, as heretofore.

The President's order provides that a man's employment in industry or in research will be considered "necessary to the maintenance of the national health, safety, or interest" only— (1) If he is actually engaged in such activity, (2) if he also cannot be replaced because of a shortage of persons with his skill or qualifications; and (3) if the removal of the man would cause a material loss of effectiveness in the essential activity in which he is engaged.

General Mills Develops Two New Food Starches

Two modified-purified wheat starches —one having highly improved stabilizing properties, the other with controlled fluidity characteristics—have been developed for wide commercial use in the food and confectionery industries by General Mills, Inc., Minneapolis.

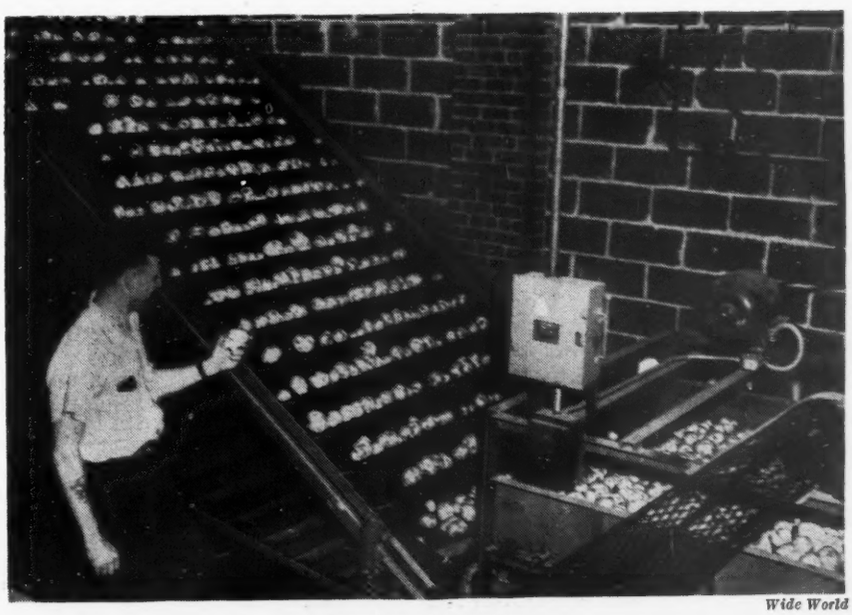
The improved wheat starches, identified as A-22 and B-24 pending the selection of trade names are the first of a series to be developed following seven years of basic research and three years of pilot plant operations at the company's Special Commodities Division in Keokuk, Iowa.

A-22 type is a thick-boiling purified and modified starch with high stabilizing power. It is said to have excellent water-holding capacity and is especially adaptable for use as a thickner and stabilizer in homogenized baby food, in wafers and cones, and as a thickener and emulsion stabilizer in salad dressing.

When used as a fruit pie filling, it gives superior texture and eating qualities, has greater tolerance to overcooking, and has a clarity similar to root starch. In soft pie filling and prepared dessert mixes, it produces a clearer, more stable gel and has less tendency to "water out". It also has a short, buttery texture and body, as well as desirable sheen in salad dressing.

Tests have indicated that A-22 starch has a higher viscosity than unmodified starches, possesses a blandness with a total absence of flavor, and takes less of the essential oils and flavoring to bring out the desired organoleptic level of the product.

The B-24 series, with controlled fluidities, have special adaptation for confectioners' use. These starches have high acceptance for use in better grade jellies and gum drops and may be utilized in a wide variety of confectionery products. Certain numbers of the B-24 series also have applications in other industrial fields.



Wide World

NICE CLEAN SPUDS

Thoroughly washed potatoes are what you'll get out of Hicksville, L. I. Set up to handle 1,200 bu. an hour, the machines were installed by Produce Growers, Inc., a co-op. The tubers are here being conveyed from washer to drier.

RMA Adds Research Projects For Second Year of Program

MANY new research projects of interest to food processors will be initiated this year by the Department of Agriculture's Research & Marketing Act program. For the second year of research into expansion of markets and new uses for farm products, Congress gave RMA $13,850,000—compared with $9,000,000, voted for this purpose a year ago.

This year, RMA officials in Washington have already allocated to specific projects the $9,500,000 they control. This is an increase of more than $3,000,000. More than half is going to some 200 projects that were started last year, the balance to about 50 new projects.

The difference between the $9,500,000, which is allocated by RMA officials in Washington, and the total appropriation of $13,850,000 is the money which is distributed to state experiment stations, as directed by the law, for research on their own or in cooperation with the USDA labs.

This year, about $2,300,000 will be spent for projects aimed at "utilization research, developing new and improved uses of agricultural commodities". The amount compares with $2,200,000 a year ago. New projects in this category of interest to food processors include the following:

Dairy—Relationship between nutritive value of butter and its lipids.

Sugar—Technology investigations, cane and beet sugar.

Soybean—Fundamental studies on composition of soybean lecithin.

A new study on the distribution of recently identified nutrients in food is one of several directed at "improving human nutrition" and extending the food uses of farm products. This group will get about $300,000 this year, compared with $200,000 a year ago.

A number of new studies are aimed at developing equipment and technological methods for improving the quality and processing of farm crops. Food executives will be particularly intereted in the following:

Frozen Foods: Determination of requirements and development of plans and specifications for freezing and storing perishable foods on farms; preparation of precooked frozen foods, and possible occurrence and significance of pathogenic organisms in frozen foods.

Poultry: Development of improved dried egg powders and dried egg mixes, through more efficient processing.

Fats and oils: Analysis of marketing methods in relation to marketing costs and margins.

Fruits and vegetables: Investigation of methods of preventing insect contamination in processed fruits and vegetables.

Dried fruit: Survey of dried fruit marketing.

Three other groups of projects less related to food processing are directed toward: (1) Improved use of manpower, soil, water, plant and animal resources; (2) reduction of hazards and risks in agricultural production, and (3) improvement and better use of farm homes, buildings, equipment, power, and other facilities.

Of the more than $800,000 worth of contracts made with outside agencies for research projects from 1947-48 funds the following are of specific interest to food processors:

Development of a method for measuring the raw stock maturity in frozen peas; contractor, Utah Agricultural Experiment Station, Logan, Utah.

Design and development of equipment for continuous recovery of juice from pear and other fruit processing wastes; contractor, U. S. Die Casting and Mfg. Co., doing business as Production Engineering Co., Berkeley, Cal.

Quality preservation of poultry products, improved products, and improved technics of maintaining quality in storage; contractor, University of Chicago.

Fundamental studies on the flavor stability of soybean oil; contractor, University of Pittsburgh.

Other projects announced earlier include contracts with four different laboratories to develop new standards for measuring the bread-baking quality of wheat, also a study of the causes of staling of bakery products.

Wide World

ALL IN A DAY'S WORK

At this Pocahontas, Mo., farm a conservation day crowd saw hundreds of men and 200 machines do in a day what the owners of the 280-acre tract estimate would require eight years of labor under normal operations. Some fields were terraced, others cleared. A pond was built and a creek straightened, assuring future water supply.

Companies Report Sales and Earnings

NET EARNINGS for Best Foods, Inc., amounted to $9,539,395 for the fiscal year ended June 30, compared with $5,288,095 for the previous year. However, in the year before, $2,411,850 represented a special deduction for an addition to the contingency reserve and payment in full of the ten remaining unfunded cost of past service benefits.

Consolidated net sales for 1947-48 totaled $105,269,971, as against $75,916,509 in the previous fiscal report issued by Best Foods.

Stokely-Van Camp showed a drop both in net earnings and net sales in its annual report for the fiscal year ended May 31. Net sales for the period were $95,110,041, compared with $107,018,513 for the previous year. Net income in the 1947-48 year totaled $2,520,504, compared with the previous year's $7,111,911. The company, however, reported a new high in frozen food sales for the year just past.

A six months' report revealed Standard Brands' net sales of $146,117,305, an increase of 8 percent over comparable sales of $135,057,791, made during the corresponding first half of 1947. Net income for the period was $5,019,241, up 31 percent over the $3,834,536 reported as net income in the first six months last year.

Plan Joint Symposium On "Yeast in Feeding"

FOOD MANUFACTURERS, nutritionists, and others interested in the production of foods and good nutrition here and abroad, are expected to attend a three-day symposium on "Yeasts in Feeding," to be held at the Pfister Hotel, Milwaukee, Nov. 7 to 9.

This symposium is sponsored jointly by the associates of the Food & Container Institute, the Brewers Yeast Council, the Yeast Industry, and the QM Food & Container Institute for the Armed Forces.

All phases of production, uses and fundamental research on brewers yeast and other types of yeast, as well as the production and application of yeast derivatives, will be covered.

The first day will be devoted to relation of research to production and utilization and basic principles of yeast culture. There will also be two production sessions. One of these will concern the recovery and treatment of brewers yeast for different food purposes, and the production of yeast derivatives, including those used as flavoring products, (hydrolysates, etc.). The other production session will consider commercial production of primary grown food yeast (dry) and the possibilities of yeast production from forest, industrial and agricultural wastes.

The program of the second day is divided into three subjects: Composition of different types of yeasts and a discussion of their constituents; the practical use of yeasts in foods; and their nutritional value, especially with regards to protein and vitamin availability. Two papers on the utilization of yeast in animal feeds—chicken, turkeys, livestock and specialty feeds—will conclude the afternoon session. Fundamental research on the biology, physiology and culture of yeasts will be the topic of the third day.

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Many other GLOBE beltings are available for whatever particular use you may have. Your mill supply house (or we ourselves) will be glad to provide a complete list of GLOBE products. And at the same time give you proven facts and figures on their long-lasting and economical qualities.

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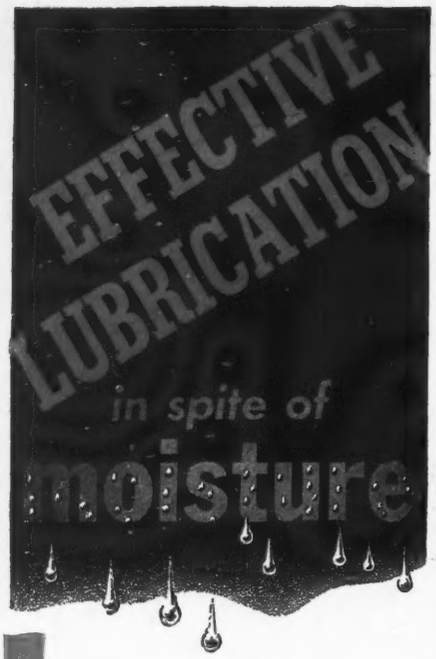

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Fire Causes $750,000 Damage at E. J. Brach Co.

Chicago Candy Plant Explosion Kills 15 and Injures Like Number

ESTIMATED DAMAGE between $500,000 and $750,000 resulted from an explosion and fire at 4 a. m. in the starch-deposited candy department of E. J. Brach & Sons' confectionery plant in Chicago. Fifteen workers were killed and more than 15 injured.

However, production operations in the plant were not entirely disrupted. Almost 30 per cent of the company's employees returned to work on the following day.

Top-floor production bore the brunt of the blast, which tore out the walls of starch rooms and cooking areas. A wing of the general offices, the testing laboratories, and a section of the shipping facilities were badly damaged.

First and second floor installations, including the packaging department, machine shop and cafeteria, received secondary fire, concussion, and water damage. Structural weakening of these floors might prove to be more serious than anticipated.

Accurate investigations are delayed pending strengthening of walls and floors most likely to have been affected by the force of the explosion. Circumstantial evidence indicates that the focal point was in the starch goods department. There is some question whether the fire preceded or followed the explosion.

Bumper Crops Change Support Price Outlook

THE BATTLE over price supports for farm products has switched abruptly due to the prospect of bumper grain and cotton crops this year.

Just a few short months ago the issue was: Should a flexible lower-support policy be put into effect immediately—or should rigid 90 percent of parity supports be continued for another year? The result was a compromise on another year of 90 percent for the storeable commodities (basics), and then a switch in 1950 to a new "modernized" parity and price support program, which would fit support prices to supply and demand.

Now, the farm congressmen who fought each other to the bitter end just this summer, are wrangling over how they can best combat a growing wave of anti-price support program at all.

The anti-price support agitation bloomed with the publication of the government's latest crop reports. These showed the prospects for either record or near-record harvests of wheat, corn, cotton and other crops that the government is committed to support at 90 percent of parity this year—and which it is also going to support next year at 90 percent of parity.

Hence there is every prospect that the government in carrying out the farm price support program laid down by Congress, will have to invest huge

sums in crop surpluses for which normal outlets cannot be found. This tying up of hundreds of millions of dollars would occur even if the government, through ECA and other agencies, is completely successful in promoting the export of huge shipments of grains, and other commodities.

Estimate Cost

No one knows the extent of the government purchase and loan programs to support farm prices this year. However, figures of $2 billion to $3 billion have been published. These guesses may not be too high. Price support experts within the Department of Agriculture itself total up conservative estimates of their own come close to the $2 billion figure. Here is how they do it, in rough, round figures:

Corn—500,000,000 at $1.45, total $725,000,000.

Cotton—4,000,000 bales at $150 per bale, total $600,000,000.

Wheat—300,000,000 bu. at $2.00, total, $600,000,000.

Potatoes—50,000,000 bu. at $1.50, total, $75,000,000.

This amount adds up to an even $2,000,000,000—but it leaves out figures for other support buying into which the government may put millions of dollars. Examples: Eggs, poultry, tobacco and peanuts.

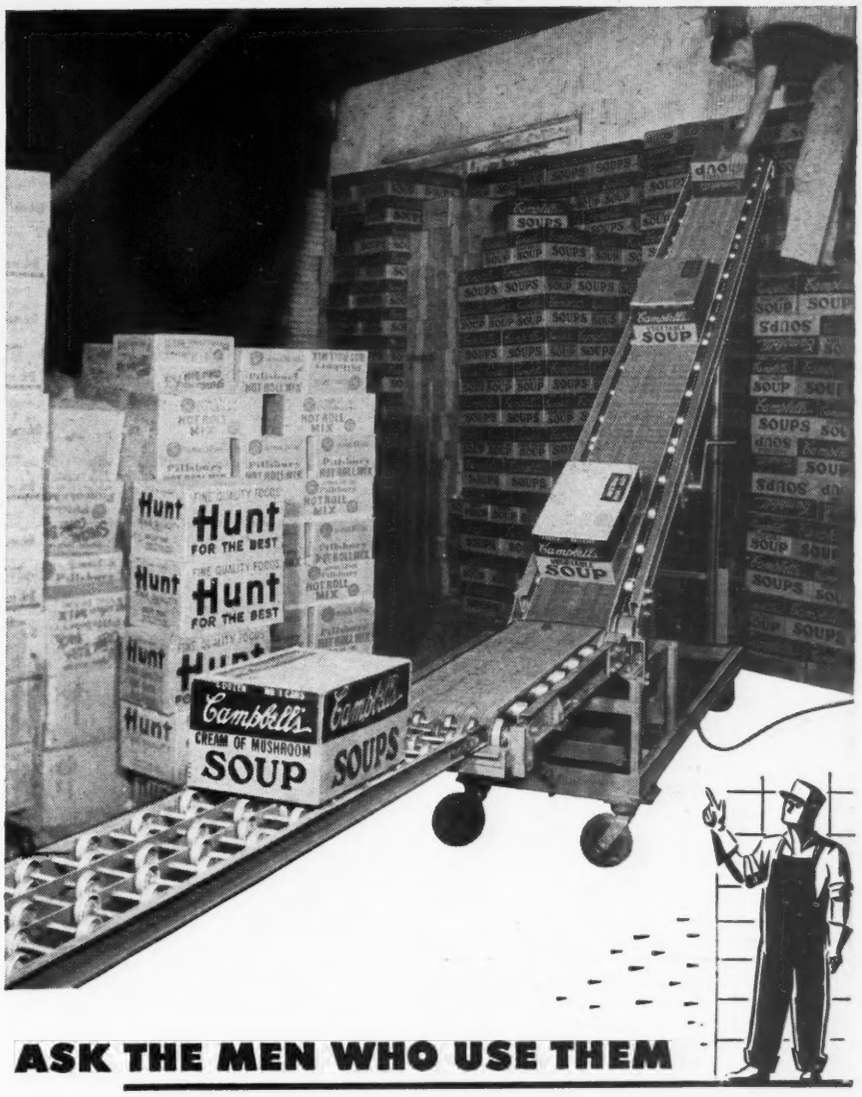
All this money is not completely down the rat-hole, of course. The government is "investing" its money in commodities, and there is a chance that it will get a sizeable amount of its investment back some day. But losses on these support operations are virtually certain.

Most farm experts at the Department of Agriculture in the farm organizations, and on the staffs of congressional committees agree that the "surpluses" that may be accumulated this year in most commodities are actually a good thing. They contend—and the figures support them—that the economy for several years now has had to get along with dangerously low carryovers of grains and fibers, and that there are benefits from the stabilizing effect of a normal inventory.

But from a political point of view, it becomes highly explosive to flatly approve of the idea of the government's handing out $2 billion or $3 billion a year to the farmers while the city voter squirms and squeals from the pressure of high prices.

So, what is going to be done?

One thing is certain now: There will be no change in the support program that Congress approved last June to cover the 1949 crop year. "Congress has given a firm commitment to the farmers," the legislators say, "and we can't go back on our



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Wide World

POULTRY INDUSTRY HAS BIRTHDAY

If this picture looks familiar, it's because you have already seen it on one of the three-cent stamps that were to go on sale in September. It's a mature age in any industry.

word." The 1949 support law provides mandatory support at 90 percent of parity for these "basic" crops: Wheat, corn, cotton, tobacco, peanuts, and rice.

But, while Congress is in session, during the first part of 1949 it is bound to be debating furiously the question of what is to be done about the 1950 law that is now on the books. This so-called "Aiken Bill" has a formula that gears support prices to supply and demand—lowering the support when surpluses are evident, and raising support prices when there's need to increase production.

Hitch is that the law provides for a "transitional" price support feature. This permits the support price to drop only 5 percent each year as figured under the present formula—until such time as it meets the lower support level, which would be provided by application of the supply-demand formula of the Aiken Bill for 1950.

If by next summer the government already has, say $2,000,000,000 tied up in surplus crops—and another similar outlay or investment must be made in 1949 crop surpluses—then it seems certain that something will be done to eliminate the necessity of plunking such huge chunks of the taxpayers' money into price supports.

It is impossible to predict what Congress may do next spring or early summer. There will be a new Congress, probably a new President and Secretary of Agriculture, and probably new men in command of the agriculture committees of both Houses of Congress. A poor crop year could easily offset the psychological effect of this year's record crops.

One guess: The "transitional" step-down feature of the 1950 law could be eliminated, and the Aiken formula permitted to go into full effect immediately. This would put the price supports of surplus farm crops either at, or somewhere near, the 60 percent of parity level rather than at the 90 percent end of the scale where they are now.

THE PROCESSING PICTURE

"M. S. G." Symposium Published by Institute

PUBLISHED PROCEEDINGS of a symposium on monosodium glutamate, held in Chicago, last March, offers the most complete data made available to date on that flavor accentuator. The publication, *Flavor and Acceptability of Monosodium Glutamate,* is, like the symposium, under the joint sponsorship of The Quartermaster Food & Container Institute, and Associates Food & Container Institute.

The 93-page, paper-covered book tells the history as well as most of the applications of this amino salt. Although its flavoring properties were discovered more than 40 years ago in the Orient, monosodium glutamate has only recently been introduced into this country. Its effectiveness with meats, seafood, soups, chowders, gravies and most cooked vegetables has already been demonstrated.

The Quartermaster Corps' interest is centered largely in the possibilities offered by "M. S. G." in flavoring combat rations to relieve the monotony of a prolonged steady diet. By vary-

ing the flavors, the same rations remain acceptable for far longer periods.

The symposium, however, was not confined to military requirements. Instead, practically every aspect of the subject is discussed—from its technical properties to its commercial application. Reading of the book is also enhanced by an author's special abstract preceding each paper presented.

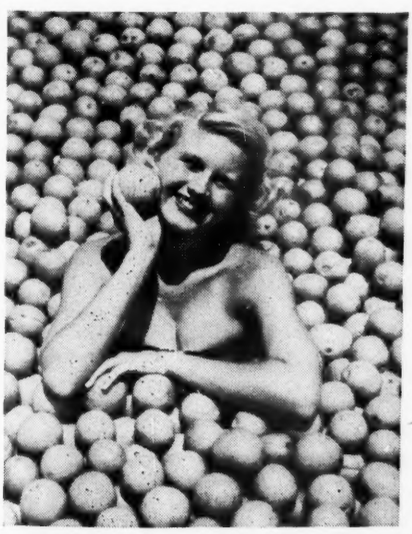
Copies may be obtained free by writing the Secretary, Associated Food & Container Institute, 1849 W. Pershing Road, Chicago 9. Those requesting copies should give their business or professional address and title.

Tenderometer Selects Fruits at Right Stage

TENDEROMETERS have been found useful in telling when to pick commercial fruits at the proper stage of firmness for marketing and for processing. Tests made at the Geneva, N. Y., Experiment Station on apples, peaches, and pears gave an accurate measure of their ripeness.

According to Drs. F. A. Lee and G. D. Oberle, who carried on the experiments, the device is also now in use at many canning and freezing plants for testing the quality of peas. Since ripening of the fruits tested is accompanied by a softening of the tissue, they supposed it might also have value in determining the harvest point of these fruits.

It is probable, they point out, that the method could be applied to any fruit, the flesh of which could be cut into cubes for the test and which contained no interfering seeds. The cubes are about ¼ in. on a side.



Wide World

SUNKIST ORANGES

California oranges have a great deal in common with Florida oranges in that they are consumed in the fresh form, and their juice is both canned and frozen. Her name is Barbara Steele.

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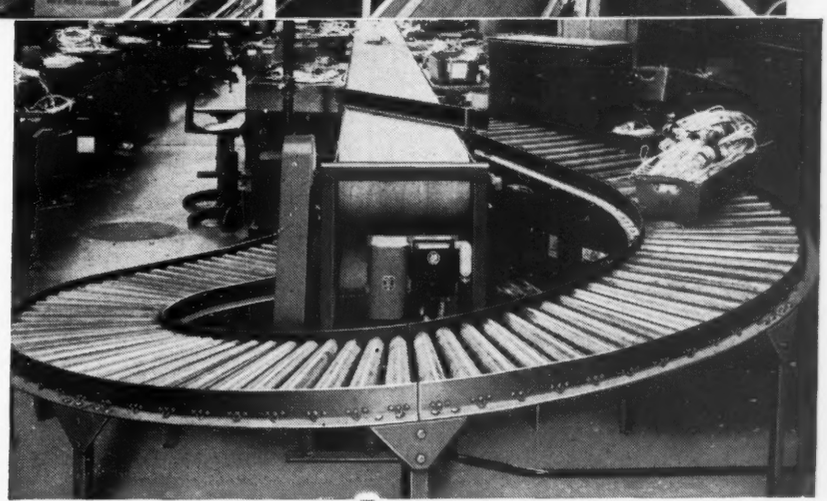

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By W. V. Cruess

Prof. of Fruit Technology, Univ. of Cal.

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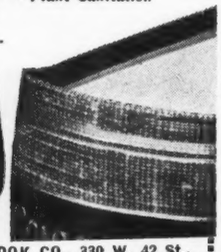

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Position Food-10-48

Wines, Fish, Vitamin K_5 Subjects of ACS Papers

EFFECT of plastering on sherries, use of vitamin K_5 in food and beverage industries, and various quality control tests for raw and canned fish were among the subjects of research papers delivered at the American Chemical Society's meeting in Portland, Oregon, Sept. 13-16.

Irene Brajnikoff and W. V. Cruess, University of California, discussed the effect of adding crude plaster of Paris to sherries before and after fermentation of the juice. The treated juice gave sherries which cleared more rapidly, had lower pH and better flavor and color. The addition of calcium sulphate after fermentation had little effect. Use of calcium sulphate is not permitted in California at present, although in Spanish sherries it is customary.

In a paper presented by Robertson Pratt, Peter P. T. Sah, Jean Dufrenoy and Virginia L. Pickering, University of California, the use of vitamin K_5 was suggested as a preservative in the food and beverage industries, because of its antifungal and antifermentation properties.

The symposium on marine products reviewed the darkening of crabmeat by iron sulphide. Ray W. Clough, O. Eugene Shostrom and E. D. Clark, National Canners Assn., told how this problem has now been solved by acidification of the meat and the use of enamel on the inside of the cans. The blue discoloration of copper from the hemocyanin in the blood has not yet been completely eliminated.

Evaluation of indexes for spoilage in fish was discussed by Lionel Farber, George Williams Hooper Foundation, University of California. The most generally applicable procedure is one based on the determination of volatile reducing substances. Results correlate satisfactorily with organoleptic tests for both raw and canned fish.

D. Verhagen and R. W. Parent, Lyle Branchflower Co., proposed a simplified method for saponifying and extracting fish liver oils in the estimation of their vitamin A content—either with the Carr-Price reagent or a spectrophotometer. Results with this method compare favorably with those obtained by the method used by F& DA.

Vitamin A stabilization in halibut liver oil was reported on by John A. Dassow, Fish & Wildlife Service. Antioxidants which effectively retard oxidation of the oil are effective also in stabilizing the vitamin A content. Various concentrations of nordihydroguaiaretic acid were tried with and without synergists to determine the point of maximum protection.

Flour Hearings

THE LONG-AWAITED hearing before Food & Drug Administration on new rules for flour aging and bleaching was scheduled to begin in Washington on Oct. 5. The major item presented by the industry for consideration is the authorization of chlorine dioxide and the elimination of nitrogen trichloride as a bleaching agent (see article on p. 105).

Also suggested by F&DA are other amendments providing that benzoyl

Wide World

THAT'S WHERE THE BARN SHOULD BE

No use getting all upset just because a couple of barns burn down. When milking time comes around, the thing to do is milk—and that's just what Ranford Wright did on his father's farm, near Flint, Mich., one day last month.

Wide World

TAP OUT YOUR ORDER

Customers just peck out their orders on machines provided by Keedoozle store in Memphis. At end of line, their order is made up and turned over to them, which is when they get to handle the packages for the first time. Owner Clarence Saunders, who earlier founded the Piggly-Wiggly chain, is reported as pleased with the operation of his new store.

peroxide may be "used with additional carriers such as dicalcium phosphate, calcium carbonate, starch, tricalcium phosphate, and others found to be harmless and suitable."

Tennessee Processings Slowed by Drought

SUMMER DROUGHT in Tennessee shortened the quick freeze and canning pack of most vegetables and fruits, according to food processing officials. Winter Garden Co., Knoxville, reported that drought and the late spring freeze hurt the strawberry and peach crops. Green beans were seriously affected by dry weather, but increased plantings and higher prices have brought packers a nearly normal supply. Beans are bringing prices about double those of last year.

Plan for F&DA Hearing On Bread Anti-Staling

WHEN the Food & Drug standards of identity for bread are finally established—which will probably be late in 1949—makers of anti-staling ingredients hope that their products will be permissible optional ingredients. Present prospect for the hearing is for late November at the earliest.

Hearings were held about seven years ago on proposed bread standards. A tentative order was issued in 1943, but wartime complications prevented

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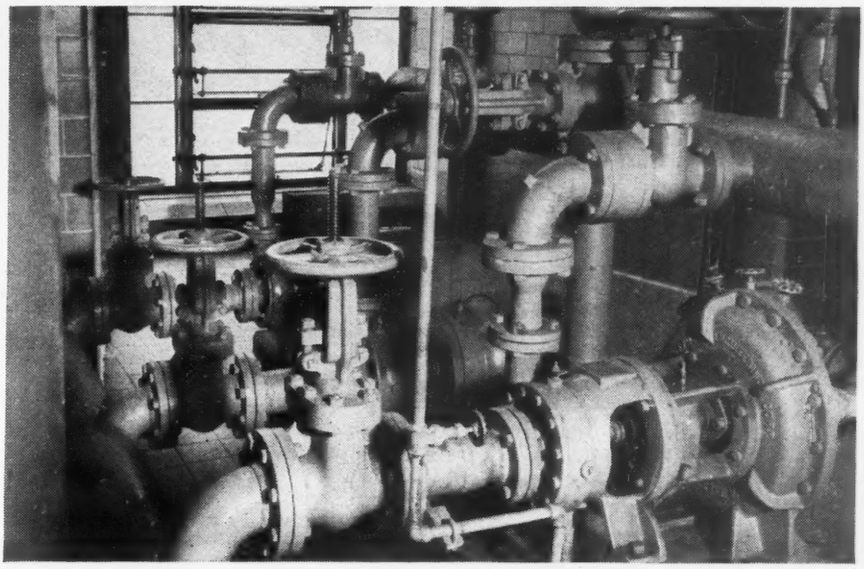
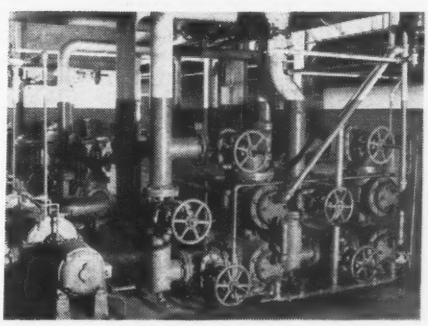
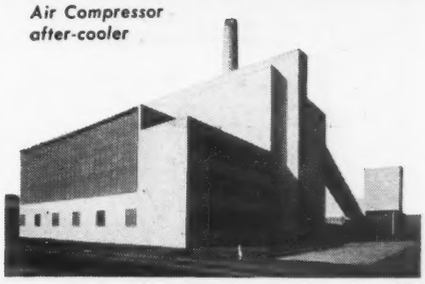


Feedwater treatment transfer pumps

The new power house at Sherwin-Williams' Chicago plant is the last word in efficiency. From the three, 3-drum, bent-tube boilers to the make-up water treatment system, every item of the installation was selected for trouble-free, economical operation. It's only natural therefore, that the list of principal equipment specifies Lunkenheimer Valves.



Air Compressor after-cooler



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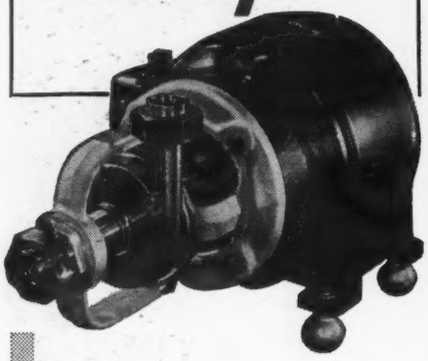

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Now that pasteurized milk can once again be left on doorsteps in Amsterdam, Holland, without fear of theft, old reliable and economical pushcart stages a comeback.

issuance of a final order. New data will now be taken by F&DA before promulgating the standards; and bakers, ingredient suppliers, consumers, and others interested, will have an opportunity to testify.

A number of different products are now being used commercially to produce a loaf of bread that will stay fresh for a considerably longer time than a loaf baked without these ingredients. Long in use are the glyceryl monostearate and distearate, which are frequently employed as emulsifying agents with various shortenings. Newer, and perhaps more effective are variations of polyethylene glycol stearate. These are made in different ways by different manufacturers, but they achieve comparable results.

Possible procedure at the standards hearing will be listing of a number of optional ingredients classified as "approved emulsifiers." Each manufacturer presumably would justify inclusion of his product in the standards in such a category. As new emulsifiers are developed, amendment of the standards to include them would be simplified.

Data on toxicity and desirability of these materials are being assembled for discussion at the anti-staling hearing. Consumer acceptance studies are also planned or underway.

DEVELOPMENTS IN DISTRIBUTION

Packers Expect to Refill Their Low Kraut Stocks

ADEQUATE cabbage acreage and favorable weather offer prospects of restoring the depleted stocks of kraut packers this year, adding assurance that a reasonable supply of sauerkraut will be available for 1949.

This was the view at the annual meeting of National Kraut Packers Assn., July 14-15, in Sandusky, Ohio. Packers observed that the shortage of kraut in 1948 was the most severe in 27 yr., and that an estimated 90 percent of all packers are already sold out.

Arthur Henkel, Slessman & Sons, Freemont, Ohio, was elected president of the association, succeeding John M. Stroup, Empire State Pickling Co., Phelps, N. Y. Martin Meeter, Meeter's Inc., Union Grove, Wis., was re-elected vice-president and Roy Irons, Clyde, Ohio, was re-elected secretary-treasurer.

Research in kraut manufacture at Ohio Agricultural Experiment Station, Wooster, was described by H. D. Brown, professor of horticultural products, Ohio State University, Columbus. The study is in cooperation with the Vegetable Gardens Div., Agricultural Experiment Station, to further evaluate effects of fertility levels on the quality of sauerkraut.

Cabbage grown on the fertility plots

Here's How Industry Uses Chemalloy To Resist Corrosion

Where corrosion is attacking your operating equipment, it's a job where you should consider Chemalloy castings. Chemalloy is the alloy specifically developed to resist the corrosive action of fluids and gases under high temperatures.

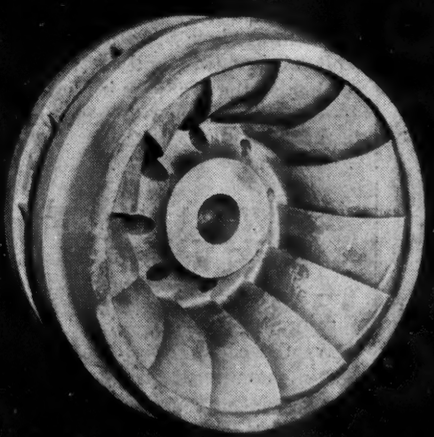
Illustrated here are typical examples of the work Chemalloy is now doing. For more complete information, write direct to Electro-Alloys Division, Elyria, Ohio

Pharmaceutical

Chemalloy filter drum used in processing penicillin where stainless metal is a must in maintaining purity. (18-8 Stainless)

Soap

Chemalloy valve body. This is one of the first castings to be produced for this user and indicates the experimental work now being conducted for Chemalloy users. (Ni-Resist Type 2)



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6500 lb. Chemalloy Turbine Runner used in water to resist oxidizing mineral and organic acids that corrode ordinary metals. (19-9 Stainless)

Food

Chemalloy screw casting used in pineapple processing plant to resist corrosive action of fruit juices. (19-9-Mo Stainless)

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LOOK! WHITE BREAD!

Children in a home in Woodford Bridge, England, had never seen white bread—until this batch reached them from Los Angeles. It was flown over the day before.

at Marietta, Ohio, was made into sauerkraut in 4-gal. jars on June 18. Fermentation is now in progress, under controlled conditions, at a temperature of 70 deg. F. Some data on acidity and color have already been obtained and Vitamin C, carbohydrate, acidity and color-index data will be correlated with organoleptic ratings.

From results of the study made thus far, said Brown, there were obvious indications that cabbage grown with a limited supply of nitrogen produces the greatest amount of lactic acid. Also, cabbage grown on plots receiving very liberal supplies of phosphorus seems to produce a kraut poor in color. This observation will be investigated further as the study continues, since it may be of real significance to kraut growers.

Short World Rice Crop No Help to Exporters

THE WORLD'S RICE SUPPLY is likely to continue short in 1949 and for a few years thereafter, but demands of importing countries may not regain prewar levels for a long time. This summarizes the observations of Dr. J. Norman Efferson, International rice specialist of the Office of Foreign Agricultural Relations following a first-hand study over six months of the rice situation in 19 countries.

The survey was conducted under the Research & Marketing Act program of the U. S. Department of Agriculture. Areas included the important producing regions in the Far East and Near East, and leading importing countries in Europe.

World rice trade in 1948 is ex-

pected to approximate 4,000,000 short tons, about 1,000,000 tons more than in 1947, but still only one-half as much as in prewar years, Dr. Efferson states. Burma, Siam and French Indochina —the three leading rice exporting countries in Asia, which supplied 90 percent of the prewar world rice trade —have improved their export position this year as compared with 1947. Exports from French Indochina, and possibly from Burma, would be larger were it not for the current political difficulties in those countries.

Although the world still is short of rice, expanded production in deficit producing countries, such as Malaya, Java, India, and China and changes in consumption habits in others due to the local rice shortages, indicate that the effective demand for rice imports is likely to be less in the next few years than during the prewar period. This means, Dr. Efferson says, that from the viewpoint of future U. S. exports, the requirements of the importing countries may be satisfied sooner than would be indicated by the trade figures.

Canada Cuts Controls On Exports of Meat

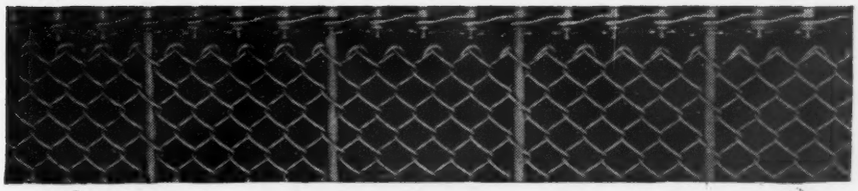
CANADA has removed controls on exports of slaughter and feeder cattle and dressed beef. Export controls on sheep, lambs, mutton and lamb carcasses had been previously abolished.

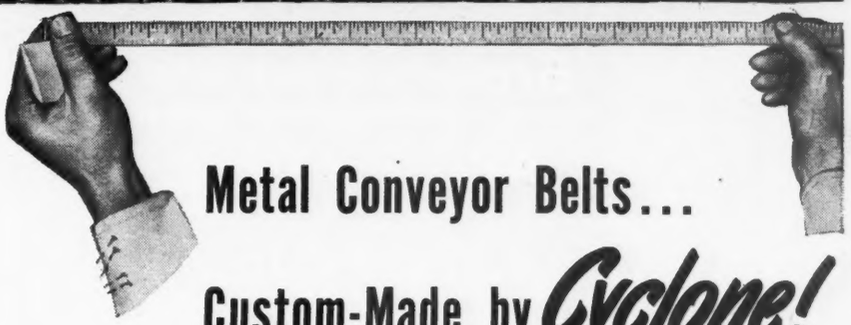
According to present estimates, it is believed Canada may export to the U. S. approximately 100,000 head of feeder and slaughter cattle during the remainder of the present calendar year. It is expected a substantial portion of this number will be feeders. While those imports will tend to augment the

Wide World

GRAPE PRINCESS

Mighty nice bunch of grapes we have here. They were among the agricultural displays at the Los Angeles County Fair, in September. We see them posed with the Princess of the Grapes because this is Los Angeles' idea of suitable contrasts. Ours, too.





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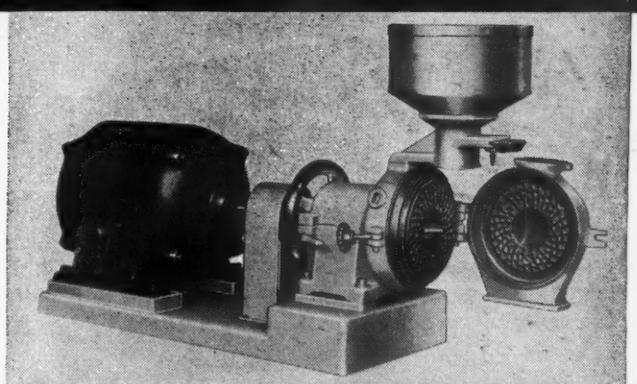

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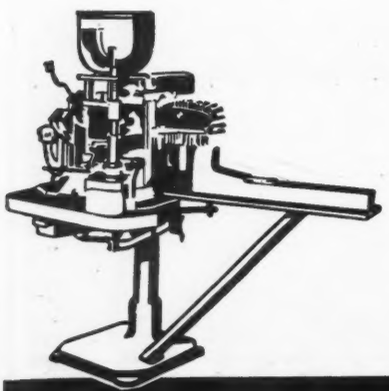

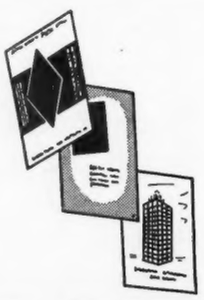

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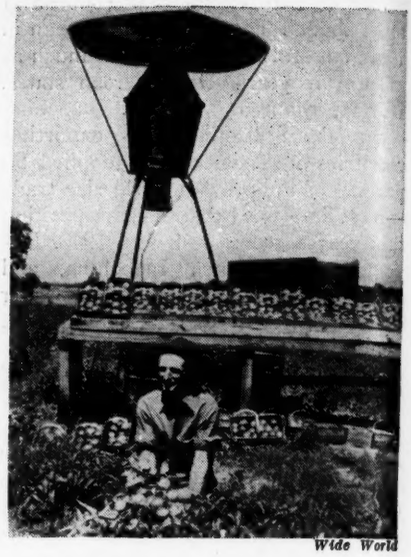


Wide World

NO-FROST TOMATOES

John S. Grimes exhibits the tomato harvest grown with the aid of his "frostguard"— which made early planting possible by supplying infra-red rays to chase the frost. The experiment was made at Plymouth, Ill., a suburb of Chicago.

U. S. meat supply, the number of cattle that will enter as a result of lifting the embargo will be insignificant in comparison with domestic cattle numbers.

These imports, however, will make up about one-fourth to one-fifth of the cattle imported from Mexico prior to the outbreak of foot-and-mouth disease in that country in Dec. 1946.

Fishery-Unit Studies West Europe Markets

A STUDY of the fish and fish product marketing situation in Western Europe, requested by the U. S. fishing industry, has been initiated by the Office of Foreign Agricultural Relations under the Research & Marketing Act.

The survey is being made by Arthur M. Sandberg, fish marketing specialist recently assigned to OFAR by the Fish & Wildlife Service of the U. S. Department of the Interior.

Although leaders of the U. S. fishing industry do not expect burdensome domestic surpluses of fish products in the immediate future, it has requested the European study to obtain information to service as a basis in formulating a program of export market development to meet the industry's future needs.

Hop Roots to Hop Here

PAN AMERICAN WORLD AIRWAYS has been informed by its Frankfurt, Germany, office that Hallertan hop roots may now be exported to the U. S. where, it is reported, they will be

grown experimentally. Substantial shipments to the U. S. by air are anticipated.

German export manufacturers in the Bizonal Area are now enjoying the advantage of reduced tariff rates.

According to the Joint Export-Import Agency in Frankfurt, a new source of Bizonal economy has been tapped for the export of beer brewed from grain that is imported especially for this purpose. Recently a beer contract was signed with Burma, but most of the present sales are made to the U. S.

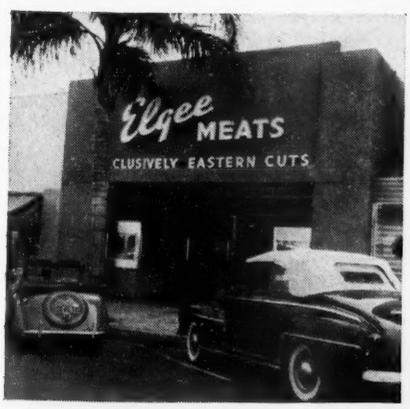
Tomatoes for School Plan

THE Department of Agriculture will offer to buy approximately 600,000 cases of canned tomatoes of the 1948 pack and approximately 125,000 cases of canned tomato paste of the 1948 pack for use in the National School Lunch Program.

Detailed terms of offers for both commodities will be sent to prospective suppliers. Any interested supplier who does not receive these offers by Sept. 7 should communicate with Bradford Armstrong, Fruit & Vegetable Branch, Production & Marketing Administration, U. S. Department of Agriculture, Washington, 25, D. C. The phone number: Republic 4142, Extension 4728.

Canada Tests Oleo Law

OTTAWA, CANADA—A legal test case was to be heard before the Supreme Court of Canada, starting on Oct. 5, to decide whether or not the Canadian Government's present ban against the manufacture, sale and import of margarine is constitutionally valid. The Court put this case at the head of the list of cases to be heard at this session.



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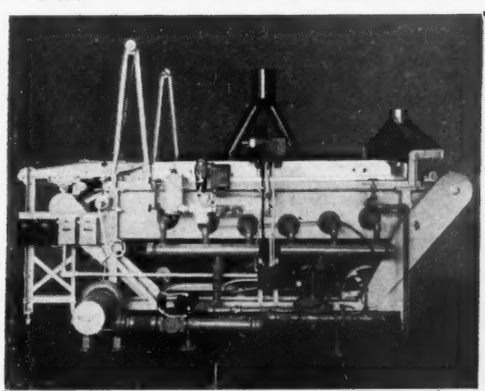

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Rice Price Supports

For 1948-crop rough rice, price supports will average about $4.08 per hundredweight, according to the Department of Agriculture. This is the equivalent of about $1.84 a bushel, as compared with $1.69 a bushel for the 1947 crop, reflecting higher parity price levels.

Prices will be supported through producer loans and purchase agreements, as announced by the department on June 14 and July 27. The support prices are based upon 90 per cent of parity as of Aug. 1, in accordance with legislative requirements.

McGRAW-HILL World News

Argentine Meat Bought For Overseas Forces

Buenos Aires—Announcement that the U. S. Army has purchased $1,000,000 worth of Argentine meat (turkeys and boneless beef, principally) for its forces in Germany may be more than just purchase for holiday seasons next December.

If the deal is received successfully—i.e. without too many complaints from U. S. packers and cattlemen—it may open the way for the Army to save up to $1,000,000 per year on cost of feeding overseas forces. The Army pays just about double that sum now, and it could get it for 50 percent less from Argentina and at the same time offer major help to stalemated U. S.-Argentine trade.

Here is the price that the Army paid for Argentine meat; Lamb, 19½c. per lb.; boneless top grade beef, 26¼c. per lb.; and turkeys, 46c. per lb.

Refrigerated Food Cars On Trial Runs in Russia

Moscow—Performance tests of new Soviet-designed refrigerated cars are being carried out by the cold storage section of the All-Union Research Institute of Railway Transport. The cars are being put through their paces in a special train transporting refrigerated shipments of diverse fresh foods—fish, meat, fruits, vegetables—in the warm climate of Soviet Azerbaidjan.

The test train is made up of five refrigerated cars, each of variant design. Systems of two of the cars comprise ice containers both in the car

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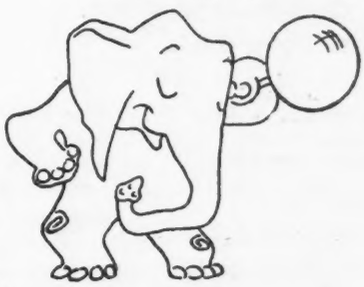

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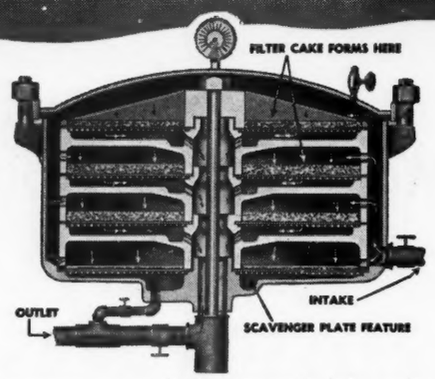

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Sparkler Filters operate on a distinctive principle, using horizontal plates, that are particularly efficient in maintaining uniformity in operation over a wide range of pressure, temperature, or viscosity conditions.

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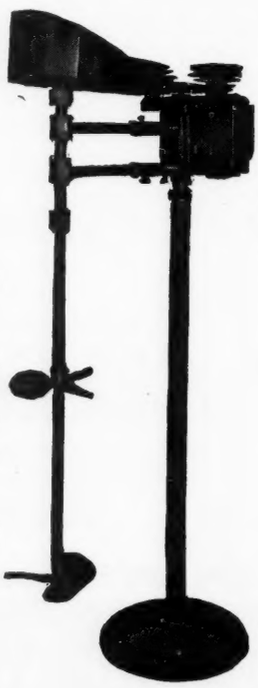

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sides and in the ceilings. In two other cars, ceiling containers in combination with ventilators (fans) are being employed.

The fifth car uses a modernized refrigerator system based on developments by the Russian engineer Kleimenov. Here, lower temperatures than are possible in ordinary ice-box cars are stated to be maintained by means of an ice-salt solution circulating in piping.

Nestle's Expands in Brazil

RIO DE JANEIRO—Nestle's Milk Products, Inc., is planning to open its fourth milk condensation factory in Brazil, somewhere in the northern part of the country. It has plants at Araras and Araraquara, in the state of Sao Paulo, and at Barra Mansa, state of Rio de Janeiro.

SCHEDULE OF EVENTS

October

5– 7—Industrial Packaging Engineers Assn., 3rd annual industrial packaging and materials handling exhibition, Sherman Hotel, Chicago.
9–11—National Poultry, Butter & Egg Assn., national convention, Hotel Sherman, Chicago.
12–16—National Chemical Exposition & Industrial Chemical Conference, Coliseum, Chicago.
12–13—Packaging Machinery Manufacturers Institute, 16th annual meeting, Hotel Roosevelt, New York City.
14–15—Packaging Institute, 10th annual forum, Hotel Commodore, New York City
18–22—National Safety Council, 36th national congress and exposition, Stevens Hotel, Chicago.
21–23—International Assn. of Milk & Food Sanitarians, 35th annual convention, Bellevue-Stratford Hotel, Philadelphia.
25–26—Boston Conference on Distribution, 20th annual forum, Hotel Statler, Boston.
25–28—National Frozen Food Locker Assn., 9th annual convention and exhibition, Sherman Hotel, Chicago.
25–30—Dairy Industries Exposition, Convention Hall, Atlantic City, N. J., (25–27) International Assn. of Ice Cream Manufacturers, Hotel Traymore, (28–30) Milk Industry Foundation, Chalfonte-Haddon Hall.
27—National Pickle Packers Assn., annual meeting, Sheraton Hotel, Chicago.
28–30—National Bakers Supply House Assn., annual convention, Edgewater Beach Hotel, Chicago.

November

4– 5—American Butter Institute, 40th annual meeting, La Salle Hotel, Chicago.
4– 5—American Society for Quality Control, 3rd mid-west conference, Sherman Hotel, Chicago.
7– 9—Joint symposium on "Yeast in Feeding," Pfister Hotel, Milwaukee, Wis.
15–17—American Oil Chemists Society, fall meeting, Pennsylvania Hotel, New York City.
15–17—Grocery Manufacturers of America, 40th annual meeting, Waldorf-Astoria, New York City.
15–19—American Bottlers of Carbonated Beverages, 2nd postwar international exposition, Convention Hall, Atlantic City, N. J.
23–25—Southern Ice Cream Assn., annual meeting, Roney Plaza Hotel, Miami Beach, Fla.

December

5– 8—American Society of Refrigerating Engineers, 44th annual meeting, Statler Hotel, Washington, D. C.
8–10—Northwest Frozen Foods Assn., Olympic Hotel, Seattle, Wash.

Changes in Food Supplies

Production

American cheese production, for July, was estimated at 95,920,000 lb., 4 percent more than the 1942-46 average for the month, but 15 percent under July, 1947. The 10 percent June-July seasonal decline was the same as last year and only slightly below the recent five-year average drop.

Creamery butter continued to decline, with production estimated at 125,970,000 lb. during July. This was 16 percent less than output in July of last year, and 22 percent below the five-year average for the month. Total production for the first seven months of 1948 was likewise 16 percent under last year, and 22 percent under the 1942-46 average for the seven month period.

Ice cream production, estimated at 70,050,000 gal. in July, was 5 percent smaller than the July output last year and was only 7 percent larger than the five-year average for the month. The June-July increase was 9 percent, compared with the 10 percent last year and the five-year average gain of 12 percent.

Frozen egg production during July was estimated at 17,681,000 lb., 22 percent lower than July 1947 output. Dried eggs, during the same month, totaled 9,047,000, lb., only slightly less than July production last year. Liquid egg output for July was 48,834,000 lb.

Poultry, canned or used in canning during July, jumped to 12,490,000 lb., an increase of 130 percent over the July 1947 quantity so used. The quantity canned or used in canning during the first seven months of this year reached a total of 85,898,000 lb., an increase of 77 percent over the 48,569,000 lb. used in the same months last year.

Lard output in July was down to 127,693,000 lb., compared with June production of 172,736,000 lb.

Wheat flour production for June, estimated at 22,800,000 sacks, was 100,000 sacks more than were turned out in May. Production for June was at the rate of 80.3 percent of capacity.

Materials

Sweet corn produced for processing is estimated, by USDA, as second only to the 1942 crop of 1,282,500 tons. Corn Canners Service Bureau warns, however, that this estimate includes corn for freezing and that unfavorable reports from many areas indicates the canned pack will not exceed 29,000,000 cases.

Chicks hatched, during July totaled 55,843,000, 16 percent more than last year's July hatch but 11 percent below the 1942-46 July average. Number of eggs in incubators on Aug. 1 was reported at 46 percent above the same date last year.

Cabbage growing under contract to kraut packers should total 70,400 tons, compared with 30,000 tons obtained under contract last year. The recent ten-year average was 82,770 tons.

Tomatoes for processing are estimated at 2,698,600 tons, which would be 17 percent less than the 1947 production of 3,368,500 tons, but is still 4 percent above the ten-year average.

Snap beans for processing should reach a total of 190,100 tons, according to early estimates. This would exceed the 1947 total by 12 percent, and the ten-year average by 9 percent.

Cranberry production is forecast at 874,000 barrels, which would be second only to the 1937 crop of 877,300 barrels. The estimate is 11 percent above last year's output, and 2 percent above the 1946 production.

STORAGE

Frozen fish and shellfish held in storage Aug. 1 totaled 127,473,945 lb., an increase of nearly 27,000,000 lb. during July. Holdings were 15 percent above the total held on Aug. 1, 1947. Holdings for Sept. 1 were estimated at about 140,000,000 lb.

Public freezer space was 72 percent occupied on Aug. 1, up only 1 point from July 1. The 1943-47 average July increase in freezer space was 4 points.

Cooler occupancy on Aug. 1—67 percent—remained the same as the month before. This is consistent with the recent five-year period.

Index

Business Week's index of business activity dropped to 194.1 for the week ended September 11, which compares with 194.8 for the preceding week, 196.1 a month previous, and 186.4 a year ago.

CONSTRUCTION NEWS

	Pending (thousands)	Awarded Sept. (thousands)	Total Awarded 1948 (thousands)
Bakery	$75	.....	$6,455
Beverages	2,989	$260	12,638
Canning and Preserving	100	.....	320
Cold Storage	225	95	1,549
Confectionery	75	.....	2,335
Grain Mill Products	425	233	10,354
Ice, Manufactured	68	.....	70
Meats and Meat Products	921	75	1,817
Milk Products	325	75	5,202
Miscellaneous	488	320	13,081
	$5,691	$1,058	$53,821

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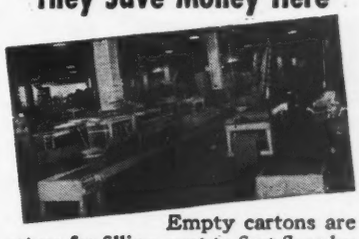
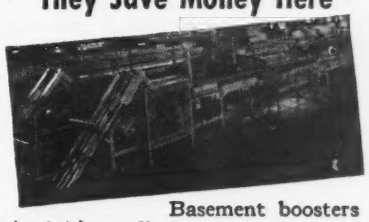


Empty cartons are set up for filling, sent to first floor by Lamson Belts and Boosters.

They Save Money Here



Basement boosters (at left) are discharging empty cartons to a horizontal filling belt on first floor.

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What Washington Thinks

By R. S. McBRIDE, Washington, D. C.

MERELY BANKERS—Far too many folks dealing with the international food problem have thought that Economic Cooperation Administration is a relief agency. That is not true. It is essentially a banking institution which allocates funds. Any food firms or food industries which deal with it regarding commodities must realize that the commodity dealings come after the ECA has taken a money action permitting this.

FARM SHIFT—For some time it has been evident that there would be a surplus of grain in the early 50's. Now it looks as though the surplus days would begin a bit sooner. The result will be a compulsion to shift on the farm from grain marketing to animal and animal products marketing, in order to adjust the balance between the cereal and the meat groups. The reasons are obvious, and the trend is clearly under way.

Food technologists have not yet begun to study adequately the meaning of this national trend relative to their plans for future food factory development. If the trend continues two or three years, it will then be too late to adjust corporation plans to take advantage of the new relationships.

A start now is clearly essential for the well-being of individual firms affected. And a very large number of food processing firms are going to be affected.

FERMENTATION MEDIA—A new use for food wastes developing in industry comes from the field of industrial fermentation, which requires foods for the various micro-organisms, yeasts, and molds used in the manufacture of a great variety of chemicals and pharmaceutical materials. Studies of the Western Regional Lab have led to two suggestions:

Juice from asparagus butts, normally thrown away, has proved an excellent food for growing the micro-organism which makes the antibiotic, subtilin. Moreover, similar use can be made of pear-canning wastes, which have proved valuable as yeast food. The yeast becomes a component of poultry feed, contributing high-protein and high-vitamin materials. Other food manufacturers having food-waste disposal problems ought to consider this new type of byproduct market.

SET-ASIDES—"The Army has a cute little device dear to the hearts of the Quartermaster Corps called the 'set-aside.'" This is the delicate form of criticism offered by **Country Almanac** on the scheme which enables military men without purchase commitments to order industrial manufacturers to reserve for them a certain share of their pack or other output.

The not too friendly description quoted is inspired by the fear, which seems quite justified, that the Quartermaster people, while disclaiming the need for set-aside orders in food, are actually going to use that device again.

SPRAY RESIDUES—Purchasers of agricultural products for canning and freezing have long been worried by a problem of reducing the insecticide spray residues within the tolerance fixed by Public Health Service and Food & Drug Administration. All such folks, and the rest of us, too, have thought that organic pest control chemicals were going to eliminate arsenic, lead, and fluorine as contaminants of food. Ultimately that will be the case. But the trend has been rudely interrupted. Over-zealous use of new weed killers and pest sprays is causing secondary difficulties in several places.

Two states, for example, are drastically restricting the use of 2,4-D as a weed killer. Apparently it is not yet time to ignore toxic residues on fruits and vegetables for processing. Certainly, Washington officials are still alert.

DEFERMENTS—Congress made only a feeble gesture toward encouraging the deferment of individuals subject to draft, insofar as their need in industry was concerned. But the research and procurement divisions of the Military

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Establishments are keenly aware that occasionally the loss of a young man to military service, from industry or research, may be a serious matter for their own technical programs. If there are really such important or key men in scientific and technical work in the food business, there is a chance that the military will take a hand to help in getting proper deferment.

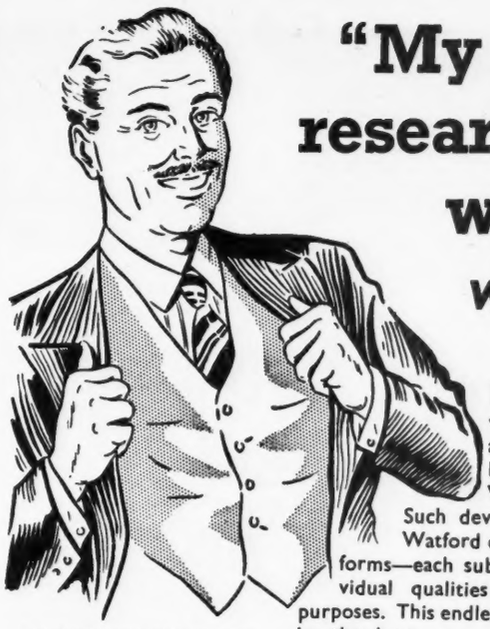
WELCOME BACK—In 1946, Philip V. Cardon (pictured on page 161) was compelled under doctor's orders to request relief from his assignment as head of Agricultural Research Administration, U. S. Department of Agriculture. In the two years intervening, he has made a comeback, which permits him to accept again that top research assignment in the department. He became Administrator in mid-August, succeeding W. V. Lambert, who has resigned to become dean at the Nebraska College of Agriculture.

Washington scientists, especially those in the department, are delighted at the return of Cardon. A more popular selection is hard to imagine. Industrial researchers who formerly dealt with him will be equally pleased, it appears.

YELLOW OLEO—Washington wonders whether housewives are going to buy, at a price including the extra tax, the newly offered ready-colored oleo. The best index will be the changes in tax returns announced by the Treasury. The Washington guess is that quite a number of consumers will pay to eliminate kitchen nuisance. But by next January a very much larger number is again expected to be calling upon Congress for tax exemption. One margarine-butter battle has ended. But the campaign will continue, Washington believes.

PRICE SUPPORT — Congress intended that price support for agricultural commodities be tapered off a bit on most commodities when it passed its latest "farm relief" measure. But the price support that Uncle Sam offers for soybeans, grown in the 1948 crop, is about 14c. higher than the price support last year. Department of Agriculture certainly can figure ways in which to maintain raw-material prices, which the food industry must pay. Perhaps election year has something to do with it.

BIG BUSINESS—Farm Credit Administration says that farmer co-ops, with 5.4 million members, did more than $7 billion of business in the last reported year (ending in 1947). Anyone buying from, or selling to, farmers finds this by long odds the biggest single market group to be considered. Major commodities other than grain, beans, and rice ($1.9 billion) were: Dairy products, $1.7 billion; fruits and vegetables, $826 million; livestock, $790 million; and poultry and eggs, $225 million.



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MEN • JOBS • COMPANIES

INDUSTRY

Archer-Daniels-Midland Co.'s East Toledo, Ohio, soybean oil processing plant has been closed because of soaring price of soybeans. Late word is that Harold Anderson, Lucas County elevator and grain operator, has purchased the plant for grain storage and will remove oil extraction machinery and equipment.

C. Brewer & Co., Ltd., announces purchase—for about $3,000,000—of J. D. and A. B. Spreckels company interests in five Hawaiian sugar plantations.

Borden Co. is reported making plans for increasing its activities in soybean industry by modernizing firm's Waterloo, Iowa, oil and meal mill. Cost is estimated at $1,250,000.

Harry F. Byrd, Inc., has recently completed construction of a modern canning plant in Winchester, Va., for processing of apples, apple sauce, and apple jellies.

California Packing Corp. has bought assets of E. J. Hurff Co. of Swedesboro, N. J. Mounting transportation costs, making it difficult for Calpack to compete with eastern companies, accounted for decision to make purchase.

Carbonated Beverages, Inc., Detroit, has been incorporated for $100,000 by Emil Walbott.

Celanese Corp. of America has established an industrial research fellowship at Rutgers University, New Brunswick, N. J., for study of behavior of fresh foods in consumer packages.

H. H. Claussen's Sons, Inc., Augusta, Ga., one of South's oldest and largest independent baking concerns, has taken over plant and business of Nugent Bakery, Inc., Savannah.

Columbia River Packers' Assn., Inc. has purchased Deep Sea Products Co., Aberdeen, Wash., marking its entrance into canning and freezing field. Association also recently completed acquisition of all Puget Sound and Alaska holdings of Campbell Investment Co.

Continental Coffee Co., Chicago, has taken over Karavan Coffee Co., Toledo, Ohio. It will be maintained as a separate corporation, continuing to use its own brand name.

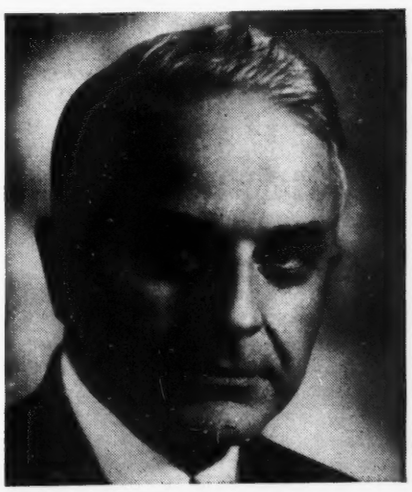
General Foods Corp. has located headquarters offices of Seafoods Div. at No. 1 Boston Fish Pier . . . Maxwell House Div. of GFC recently completed a $450,000 modernization program in Houston for processing of "Minute Rice".

"BING" CROSBY

Elected a director of Vacuum Foods Corp., "der Bingle" will launch a series of daytime radio programs to plug Minute Maid, the firm's quick frozen orange juice concentrate. Company plans to step up production and increase its distribution area during the coming year. Product is now sold in 30 eastern and midwest states.

RALPH McMILLEN

President of Bristow Peanut Co., Bristow, Okla., he is newly elected chairman of National Peanut Council board of directors. Other officers include William F. Seals as executive vice-president and William Birdsong, J. Sargent, H. Richey, and C. Johnson as vice-presidents.



DR. P. V. CARDON

Appointed head of Agricultural Research Administration, he was recipient, in May 1948, of USDA Distinguished Service Award. He fills ARA post vacated by Dr. W. V. Lambert, who resigned to become dean of Nebraska College of Agriculture.

HERBERT F. KRIMENDAHL

Elected president of Stokely-Van Camp, he has a broad background of 30-yr. experience in food industry, including presidency, in 1940, of National Canners Assn. He succeeds William B. Stokely, Jr., who becomes chairman of board.

The Glidden Co. has announced plans to build a new soybean extraction plant in Indianapolis at an estimated cost of $3,000,000.

John Hilberg & Son, Cincinnati meat packer, has begun operations in new $2,250,000 plant in that city.

R. A. Johnston Co., maker of packaged candies and fountain supplies, has begun operations in a newly completed plant in Hillside, N. J., replacing former plant in New York City.

The Kraft Foods Co. recently bought for $611,000 104-acre government war plant at Garland, Tex. Original cost of construction was estimated at $2,000,000.

J. C. LaRue Co., Madisonville, Tenn., canners, has leased for 10 yr. buildings

DETECTO SCALES

There's a precision-accurate Detecto Scale for your specific weighing and counting need. The Detecto helps increase production, yet assures you maximum accuracy by making slightest weight discrepancies immediately visible.

DETECTO-GRAM CROSS TOWER MODEL

One more Detecto-Gram Scale to speed your production. Model 1C-71-05 is for bench work or hand packaging. Specially designed cross tower for speed—convenient commodity platter—registers every ¼ ounce to 16 lbs.

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Four Modern Fortresses For Guarding The Nation's Foods

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LT. COL. J. S. KUJAWSKI

New commanding officer of Quartermaster Food & Container Institute, Chicago, he is successor to Col. Charles S. Lawrence, who was assigned to Camp Lee, Va., to serve as president of Quartermaster Board.

at former USA air base at Halls, Tenn., and will move a canning unit there from company plant at Hohenwald, Tenn.

Productos De Cannanea, Sonora, Mexico, has been awarded USDA contract for 10,000,000 lb. of canned meat and gravy.

PERSONNEL

Dr. Carlyle G. Caldwell, since 1940 a member of research staff of National Starch Products, Inc., New York City, has been appointed company research director.

James P. Casey has resigned as head of paper mill laboratory of A. E. Staley Mfg. Co., Decatur, Ill., to accept an associate professorship in pulp and paper department of Syracuse University.

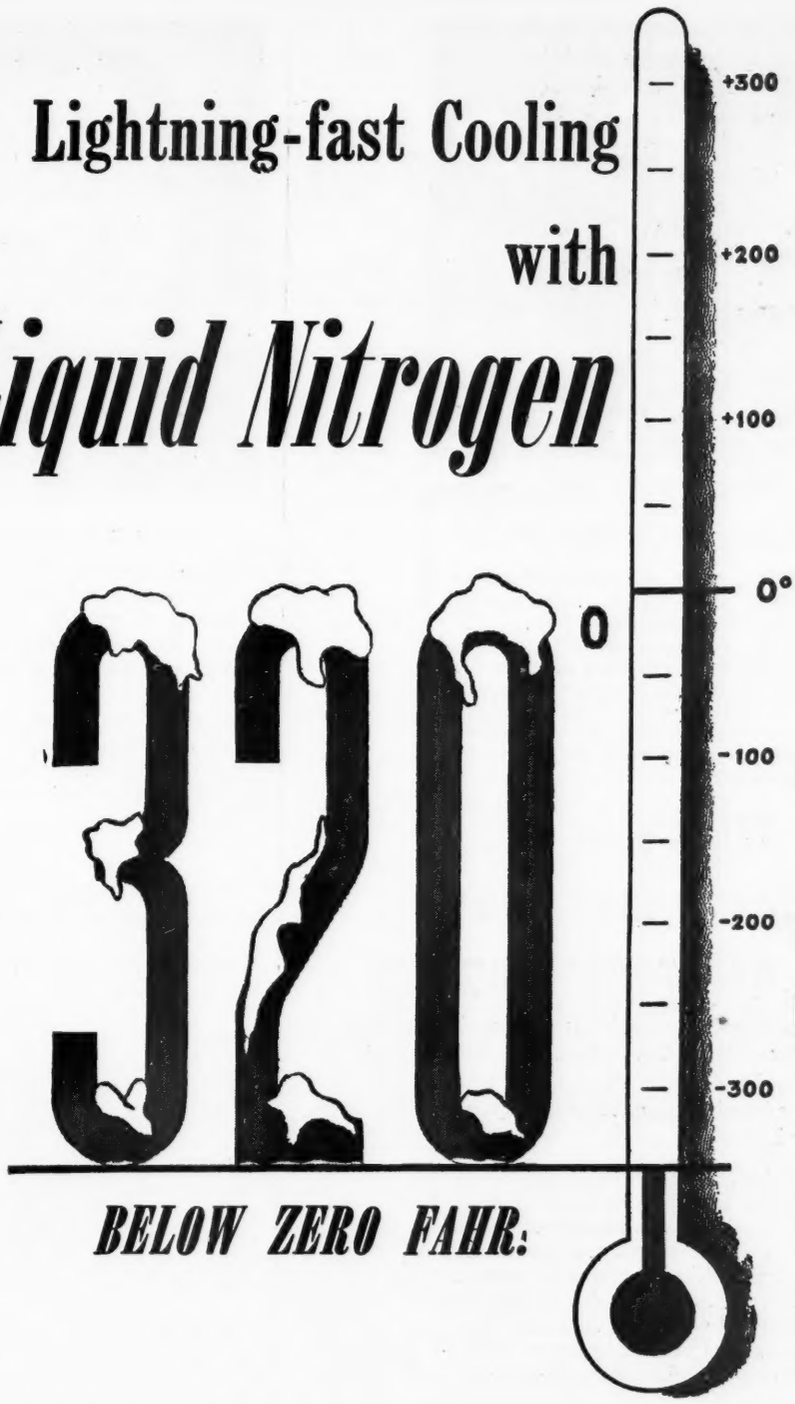
E. A. Cottrell is new manager of Round Rock Cheese Co., Round Rock, Tex. He succeeds A. H. Kaufman, who is reported to have become production manager of Superior Dairies, Austin, Tex.

Edward J. Glynn, long associated with New England brewing industry, has been elected vice-president and general manager in the executive reorganization of James Hanley Co., Providence, R. I.

Lee Hickox, executive staff consultant, Container Laboratories, Inc., Chicago, has been elected a vice-president. He joined company's staff early in 1948.

G. E. Hilbert, director of Northern Regional Research Laboratory, U. S. Bureau of Agricultural & Industrial

Lightning-fast Cooling with *Liquid Nitrogen*



- Can be used for rapid cooling or for obtaining extremely low temperatures.
- Inert to all products.
- Easy to use—can be applied directly to products to be cooled.

LINDE high-purity liquid nitrogen is available in commercial quantities at low cost.

It is sold in tank-truck and tank-car lots and stored as liquid in special containers at the user's plant for use as needed.

LINDE engineering service is available to assist in the application of liquid nitrogen refrigeration to any product. Just call or write any LINDE office.

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

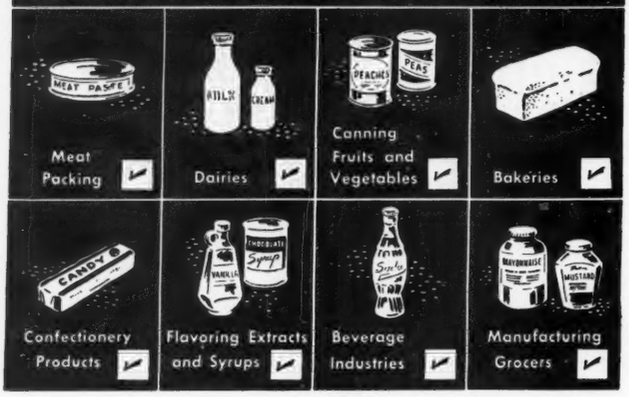
30 East 42nd St., New York 17, N.Y. UCC Offices in Other Principal Cities

In Canada: DOMINION OXYGEN COMPANY, LIMITED, Toronto

Linde Trade-Mark

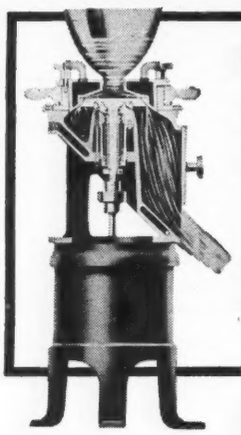
The word "Linde" is a registered trade-mark of The Linde Air Products Company.

Partial check list of fields served by Premier



Meat Packing ✓ | Dairies ✓ | Canning Fruits and Vegetables ✓ | Bakeries ✓

Confectionery Products ✓ | Flavoring Extracts and Syrups ✓ | Beverage Industries ✓ | Manufacturing Grocers ✓



What's in this Premier Colloid Mill?

This cutaway view shows the simplicity of its design . . . its rugged rotor (only moving part) . . . its husky bearing construction . . . its micrometer adjustment of clearances . . . its accurate centering of rotor in stator. *To sum up;* What is designed into and built into a Premier Colloid Mill assures hydraulic shearing action at its best.

What's in it for executives in charge of processing?

For one thing: Better Products More Profitably Processed . . . for another; Increased Production at Lower Cost. The efficient, economical Premier Colloid Mill, widely accepted by users in many fields as a versatile, adaptable means of better dispersions, does these jobs in many industries;

Dispersing solids in liquids and liquids in liquids, Premier insures more finely divided colloidal suspensions and promotes immediate chemical reaction . . . *Disintegrating* solid particles or the fibre and cellulose in animal or vegetable tissue — instantly exposing these particles to wetting or extractive action of suspending liquid . . . *Emulsifying* — achieving non-separating emulsions of all viscosities . . . *Homogenizing* — assuring superior homogenized products by compelling uniform distribution of the dispersed phase throughout the mix.

Whatever your plant processing requirements, write for our descriptive catalog using the coupon below. If you have special processing problems involving colloidal suspensions, write us and let us tell you how a Premier can help you.

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Premier Colloid Mills, Ltd., London, England

PROF. B. L. HERRINGTON

For research in dairy chemistry at Cornell, he received $1,000 Borden Award in Chemistry of Milk. It was presented at Western Session of 114th national meeting of ACS, held Sept. 13 in Portland, Ore.

Chemistry, Peoria, Ill., is now chief of Bureau in Washington. He succeeds Louis B. Howard, who resigned to head Department of Food Technology, College of Agriculture, University of Illinois.

L. E. McQuillen, formerly milling superintendent of Mennel Milling Co., Fostoria, Ohio, is now superintendent of milling operations for Valier & Spies Co., St. Louis, Mo.

Walter F. Pretzer, of Cleveland, was elected president of Vegetable Growers' Assn., Inc., at recent convention in Baltimore.

Morton M. Rayman, former head of biochemical section, Fermentation Research Dept. of Publicker Industries, Inc., Phila., is now chief of Microbiological Branch, Food Research Div. of QF&CI for Armed Forces, Chicago.

Richard Tobin, former production manager of Deerfield Packing Co., Bridgeton, N. J., is now with Aroostook Potato Growers, Inc., Presque Isle, Me.

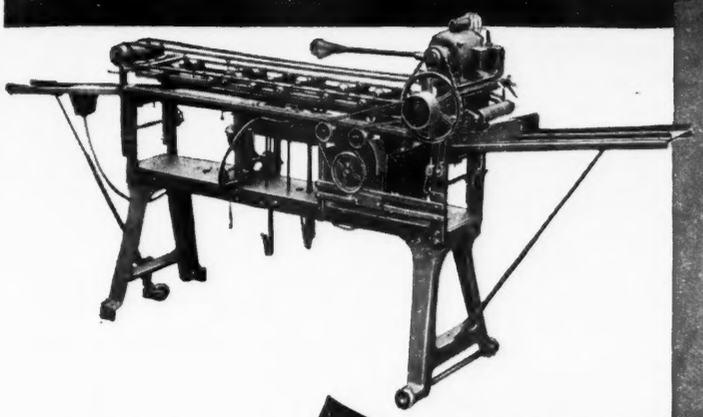
ASSOCIATED INDUSTRIES

Blaw-Knox Co. has received a contract from Ralston Purina Co. for construction of a new 200-ton-per-day soybean solvent extraction plant at Bloomington, Ill.

Food Machinery Corp. announces its entry into dry packaging machinery field through acquisition of Stokes & Smith Co. of Philadelphia. FMC is also reported negotiating purchase of con-

Warehouse equipment

that Breaks "Bottlenecks"

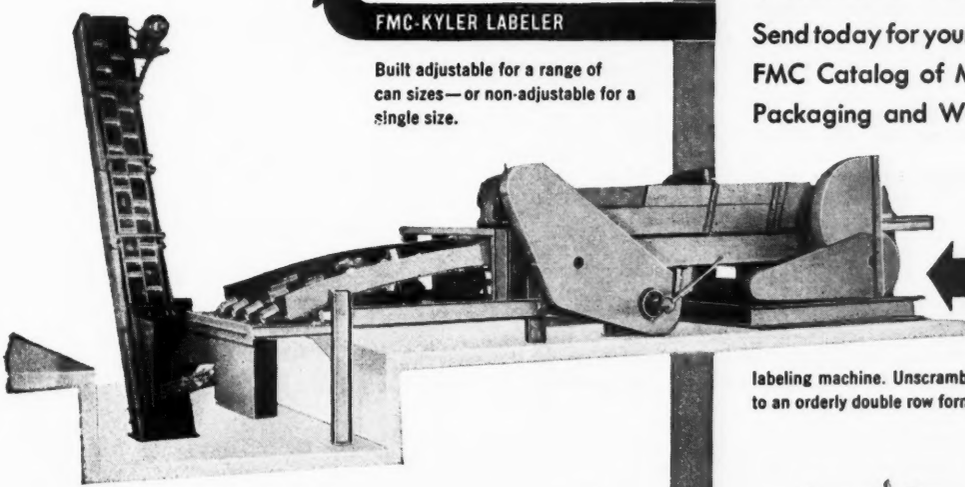


FMC-KYLER LABELER

Built adjustable for a range of can sizes—or non-adjustable for a single size.

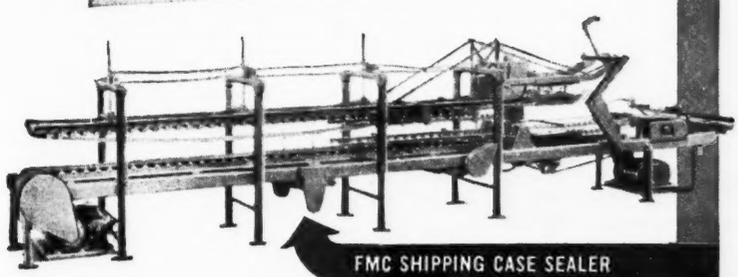
You can end wasteful delays and reduce can damage in the warehouse and cannery by installing FMC high-speed filled can handling equipment. A fully mechanized line from processing to sealed shipping case.

Send today for your Free Copy of the 260-page FMC Catalog of Modern Processing, Canning, Packaging and Warehouse Machinery.



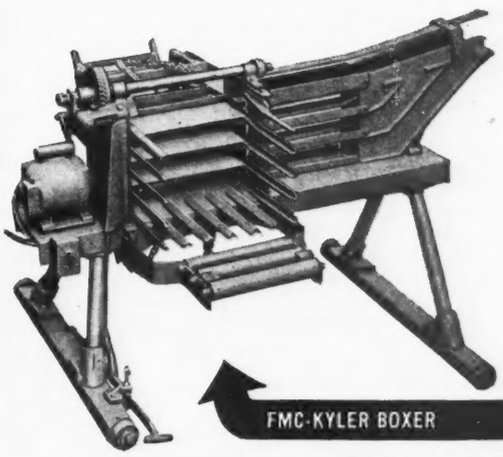
FMC UNSCRAMBLER

A high-production can-aligner designed to speed up the delivery of filled cans to the labeling machine. Unscrambles and arranges cans—from a jumbled mass to an orderly double row formation—in record time.



FMC SHIPPING CASE SEALER

A fully automatic machine for gluing and sealing top and bottom flaps.

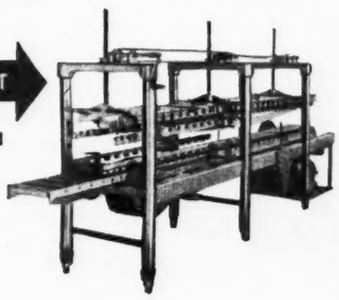


FMC-KYLER BOXER

Motor Drive; for any single size can. Works at maximum speed. Minimum man power and floor space required.

FMC COMPRESSION UNIT

A sealer for hand-glued shipping cases—for either top or bottom sealing or for both.

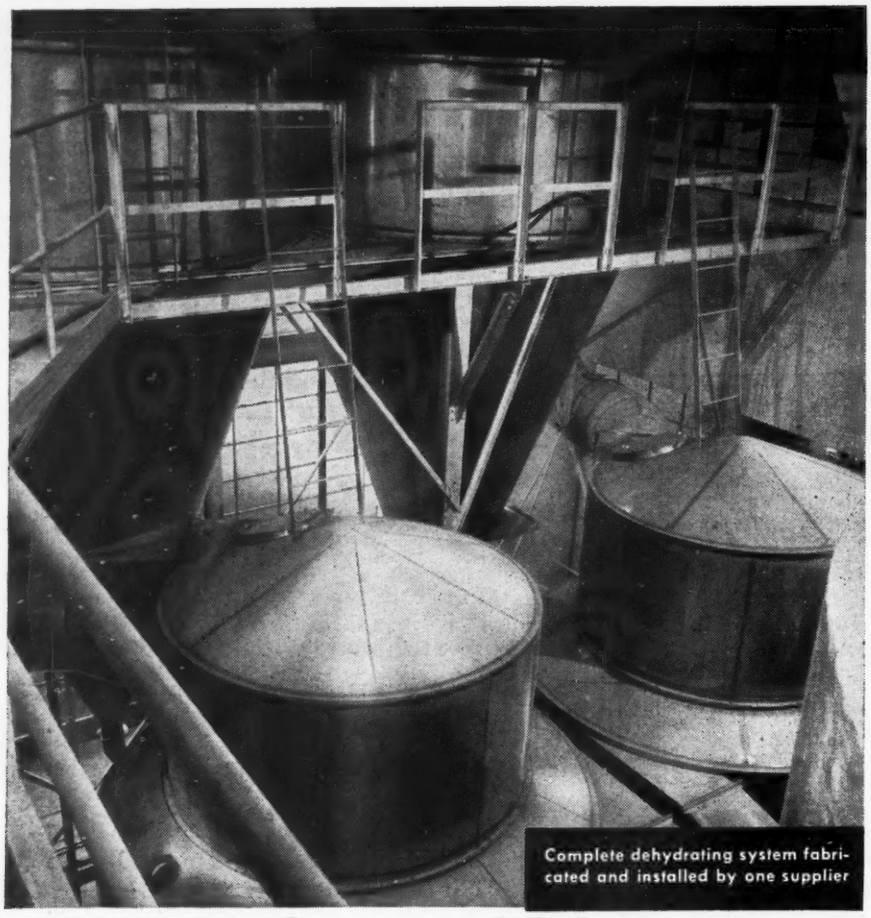


K-400

FOOD MACHINERY CORPORATION

SPRAGUE-SELLS DIVISION • HOOPESTON, ILLINOIS

BALTIMORE • NEW YORK • SAN JOSE, CALIFORNIA (ANDERSON-BARNGROVER DIVISION)



Complete dehydrating system fabricated and installed by one supplier

DAY stainless steel fabricating meets exacting specifications

A single dehydrating plant which could be used for whole milk, skim milk, powdered eggs and ice cream was required by Delaware County Farmers' Cooperative Milk Company, Delhi, New York. Naturally, the equipment had to resist corrosion and be sanitary. But above all, because of its many uses, it had to be *easy to clean.*

Corrosion-resistant stainless steel was recommended by engineer John I. Ormond of East Grand Rapids, Mich., to meet high sanitary requirements. Ormond designed the complete installation in cooperation with **DAY** Company engineers. The equipment consisted of 5 **DAY** DUAL-CLONES, spray chamber with turbulator, and all necessary duct work and structural steel.

Due to Ormond's previous business relations with The **DAY** Company, he had complete confidence in their ability to custom-build the entire installation. Expert **DAY** mechanics and welding technicians fabricated this equipment from stainless steel. To insure sanitary conditions, they polished *smooth* all inside surfaces in contact with food.

Today, the modern dehydrating plant of Delaware County Farmers' Cooperative stands as another example of **DAY** Company's ability to fabricate equipment of stainless steel for the food industry.

DAY Company fabricates equipment of stainless steel up to 10 gauge for any branch of the food industry. Capable DAY engineers cooperate with you or your engineer to work out construction drawings and shop details. Their expert technicians custom-build your equipment to specifications. DAY Company's 67 years of service to industry assure quality fabricating at minimum costs.

*For information on stainless steel fabrication for your plant, write-to-***DAY!**

SINCE 1881

The DAY Company

817 3rd Avenue N. E., Minneapolis 13, Minn.

IN CANADA: P. O. Box 70D, Ft. William, Ont.

Representatives in principal cities

trolling interest in Austral Otis Engineering Co., Ltd., Melbourne, Australia.

Owens-Illinois Glass Co.'s Container Div. has opened Duraglas Center in Toledo, Ohio, as a customer research and market development facility.

Package Machinery Co. announces that Harold Mosedale has been transferred from N. Y. sales staff to East Longmeadow factory and will be in charge of production control.

The Rust Engineering Co. of Birmingham, Ala., has been awarded contract for construction of Macon, Ga., multi-million dollar margarine plant of Glidden Co.

Visking Corp., Chicago sausage casing maker, has purchased 17½ acres of land in Lindsay, Ont., for construction of a one-story 75,000-sq. ft. factory.

DEATHS

Frank L. Barker, secretary of American Sugar Cane League, owner of Clotilda Plantation, and manager of Valentine Sugars, Inc., at Thibodaux, La., Aug. 23.

Edward C. Byrnes, 83, chairman of board of Byrnes & Kiefer, bakery supply concern of Pittsburgh, in St. Petersburg, Fla., Aug. 25.

Louis F. Champlin, 52, head of Poultry & Dairy News Div. of USDA since 1926, at his home in Brooklyn, N. Y., Aug. 28.

John Tagar, 68, chairman of board of Agar Packing & Provisions Co., Chicago, Aug. 27.

H. W. Gally, 61, manager of oils division, A. E. Staley Mfg. Co., Decatur, Ill., Aug. 8.

Max H. Guggenheim, 70, chairman of board and founder of Guggenheim Packing Co., Chicago, Ill., Aug. 8.

William H. Harrison, retired research director of Continental Can Co., in North Hollywood, Cal., Aug. 7.

Paul Schulze, Sr., 84, chairman of board of Schulze & Burch Biscuit Co., Chicago, Aug. 14.

Mrs. Ora Snyder, 72, formerly president and recently chairman of board of Mrs. Snyder's Home Made Candies, Inc., Chicago, July 18.

George Warren Weatherly, 80, board chairman of Western Dairy Products Assn., president of Crystal Ice & Cold Storage Co., board member of Creameries of America, and vice-president of Portland Grand Central Market, in Portland, Aug. 12.

BEMIS MINUTE MOVIES
FOR SHIPPERS WHO WANT TO SAVE TIME AND MONEY
MR. X CURES HIS ALLERGY
2ND CLASS
Mr. X, a first-rate product, traveled second class, which he felt was a necessary economy.
But, by traveling this way, heat and dryness stole his energy.
USE BEMIS WATERPROOF BAGS
Dampness made him a drip . . . sapped his vitality enroute to work. Then he learned about Bemis Waterproof Bags . . .
and got quick relief from travel hazards. Now he gets this first-class accommodation which actually costs less in the long run.

Bemis Waterproof Laminated Textile Bags are light in weight yet are the strongest shipping bags made. They are tested *before* they're put to work. *These pre-tests stop protests* . . . assure complete satisfaction.

If the exact Waterproof Bag you need doesn't exist, the Bemis Research Laboratory will design it for you. For prices and full information about these safe, economical packages, mail the coupon today.

BEMIS BRO. BAG CO.

Waterproof Department

Nation-wide Production and Sales

BEMIS Waterproof BAGS

Bemis Bro. Bag Co., 408-C Pine Street, St. Louis 2, Mo.
Send details about Bemis Waterproof Bags for
(Product)

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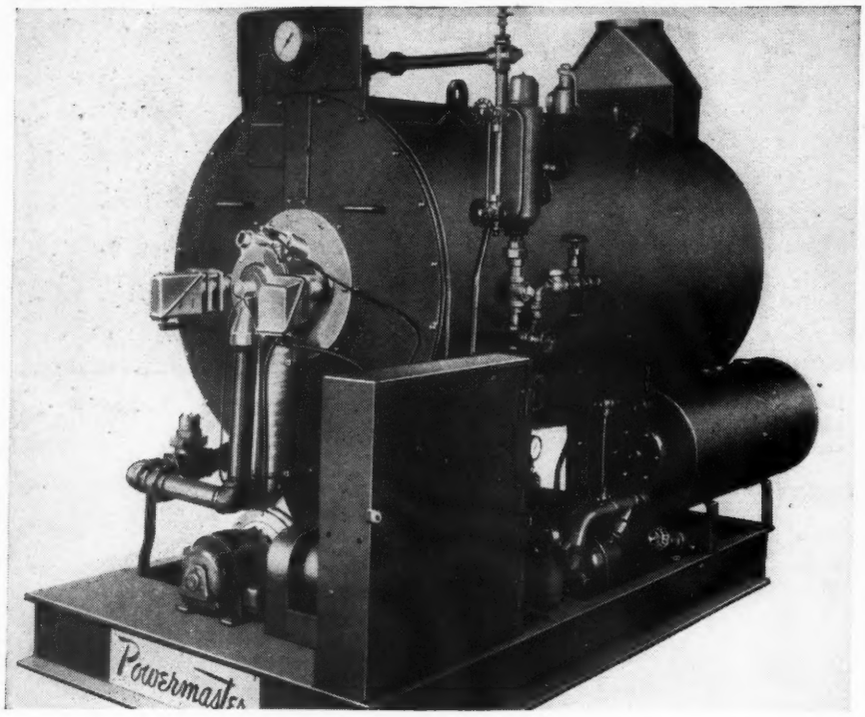
City_____ Zone____ State____

FOOD EQUIPMENT NEWS



Versatile Steam Generating Unit 1

FUEL FLEXIBILITY is offered in Powermaster, a new stream generating unit which burns light oil, heavy oil or gas. Maker is Orr & Sembower, Dept. 1, Reading, Pa. Since all three fuels are burned with same burner, and changeover takes only 10 min. or less, almost constant steam production is possible.

It is believed that this new unit will be especially efficient and economical in food processing plants, where interruptible or off-peak gas service rate are in effect. Use is also recommended in areas where oil shortages may occur.

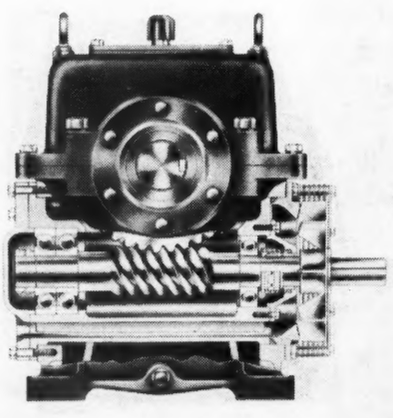
Generator ranges from 15 to 200 hp., and is fully automatic. It is stated to burn heavy fuel with same complete combustion with which it burns light oil and gas. Among features are automatic operation of heavy fuel combustion and modulated control of flame-volume to maintain constant steam pressure as steam demand varies.

New design is reported to simplify operation and maintenance. Free-swinging rear cover makes tubes quickly accessible for cleaning, since they can be exposed in 3 min. Condensate return system is mounted on base, which gives more headroom and permits installation in smaller space. Automatic controls shut off boiler in case of flame failure.

Worm Gear Drives 2

A NEW LINE of enclosed worm gear drives of both horizontal and vertical types is announced by Foote Bros., Dept. I, Chicago. Maker states units are smaller in size than conventional drives of equal capacity. Among features reported are: Greater load carrying capacity, accomplished by means of a new technic in generating gears; increased thermal capacity, achieved by immersion in the oil reservoir of an air channel cylinder through which passes a high velocity stream of cool air; and prevention of oil leakage by use of carbon lapped-ring-type seal.

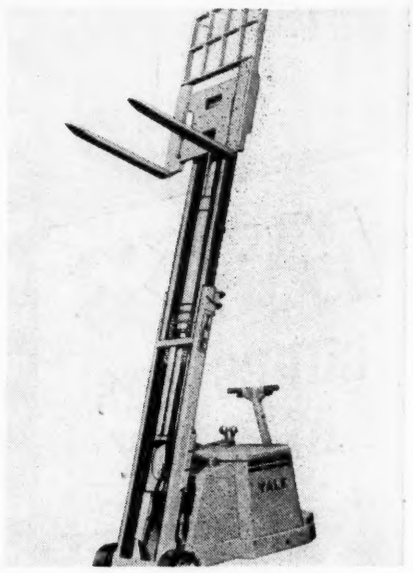
Hypower worm gear drives are available in horizontal and vertical types in a wide range of standard ratios to meet practically any need. These units comply with speed-ratio standards adopted by American Gear Manufacturers Association (AGMA) and National Electric Manufacturers Association (NEMA).



Lift Truck 3

DESIGNED to make possible maximum use of available headroom in high-stacking operations, a new 120-in. telescopic Worksaver has been announced by Materials Handling Div. of The Yale & Towne Mfg. Co., Dept. I, N. Y. C. New tilting fork model has a capacity of 3,000 lb. High reach—a full 10 ft.—can be used profitably for extension to such levels as mezzanines, in servicing overhead cables and ducts, and in loading trucks and rail cars from ground level. Range down to low of 83 in. is accomplished by means of a ram-within-a-ram. When an outer hydraulic piston has fully extended upward, an inner one begins to extend downward, doubling available lift.

Truck travels at 2 mph. under full load, lifts 8 ft. per min. with 2500-lb. load, and tilts a full 18 deg. in 10 sec. Total weight of truck, including a 19-plate battery, is 3,640 lb. Though battery-powered, unit is guided by a walking operator. Truck dimensions—only 33 in. wide x 64 in. long—make unit desirable where aisle space is narrow, where freight cars or street trucks must be entered for loading purposes, and in riding elevators.



Smoke Recorder 4

TO MEASURE and record accurately the density of smoke or dust in flues or ducts, new electronically-operated smoke density recorder has been developed by Bailey Meter Co., Dept. I, Cleveland. Records thus obtained will prove compliance with smoke ordinances, and under certain conditions will give first warning of faulty combustion conditions in furnaces. Instrument consists of a standard Bailey electronic recorder, a bolometer type smoke detector, and a sealed beam light source.

Bolometer type smoke detector and sealed beam light source are used as primary element. They are installed on

opposite sides of smoke passage so that beam is directed at tungsten filament of bolometer. Amount of radiation reaching filament is determined by density of smoke or dust; and temperature of filament is dependent upon amount of radiation reaching it. Filament temperature is shown by electronic recorder in terms of smoke density.

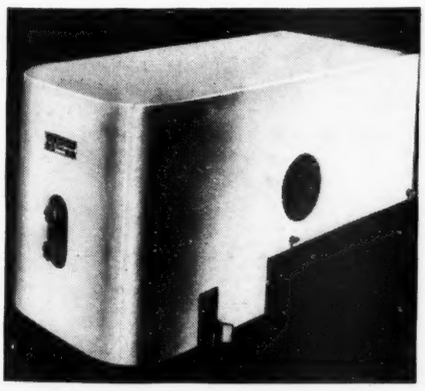
Small Tachometer 5

DESIGNED for continuous operation, a completely new, small-size electric tachometer is announced by Electric Tachometer Corp. Dept. I, Philadelphia. Measuring 2¾ in. x 5⅜ in., small sturdy unit is stated to be particularly adaptable for indications of speed and production. Housed in a cast bronze case, unit will operate in any position through a wide range of temperatures and is substantially free from effects of stray magnetic fields. Grease-packed ball-bearings are designed for accuracy and long life. Various driving shaft arrangements are available to meet wide variety of operating conditions. Suitable assortment of indicating meters is also available.

Heat Sealer 6

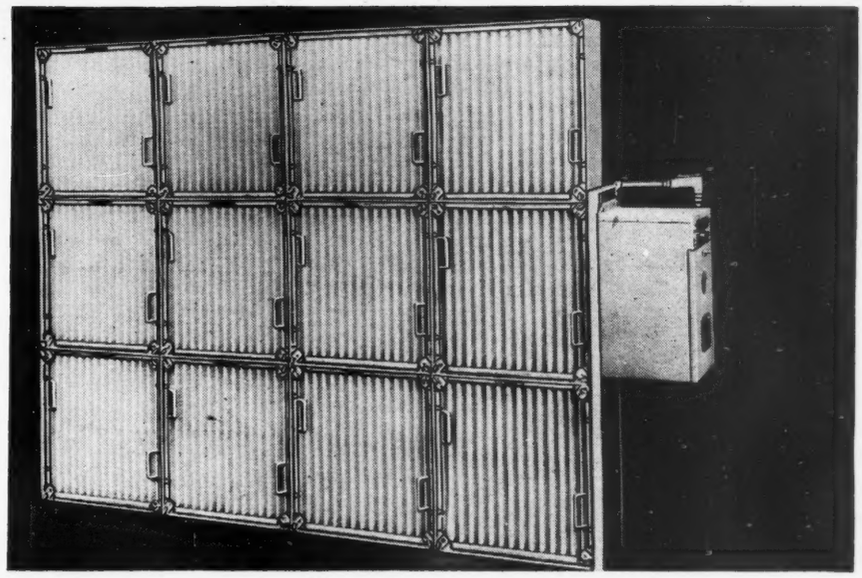
STURDILY constructed and designed for severe high-speed operating conditions, a new type heat sealer is announced by A. C. Hills & Co., Dept. I, Newark, N. J. Employing two sets of heated rolls, it heat-seals laminated foil and kraft bags without preheaters, belts or chains. Thus, unit is of simple compact design occupying a minimum of conveyor space, and maker reports that very little servicing is required.

Sealing rolls are positively driven to lower the possibility of slippage. Each pair includes one pressure roll that automatically compensates for variations in bag thickness and protects machine from damage by foreign material passing between rolls. Pressure is readily adjusted by means of knobs at front of machine. Speed is variable, permitting roll speed to be exactly synchronized with conveyor



belts or other machines. This adjustment is made with a handwheel on rear control panel.

Ball and Timken bearings are used throughout, and speed reduction is accomplished through an inclosed grease-filled gear box. Rolls can be operated at high temperatures permitting exceptionally high operating speed of machine.



Electrostatically Charged Air Filter 7

ELECTRO-PL, electrically energized air filter, has been developed by American Air Filter Co., Inc., Dept. I, Louisville, Ky. Collector element of filter is electrostatically charged Airmat paper—a laminated cellulose product composed of a number of plies of porous, tissue-like sheets, formed of short fibres in "jackstraw" arrangement. When an electrostatic charge is applied to paper, plies tend to separate, each individual fiber becoming a collecting electrode which attracts and holds dust and smoke particles.

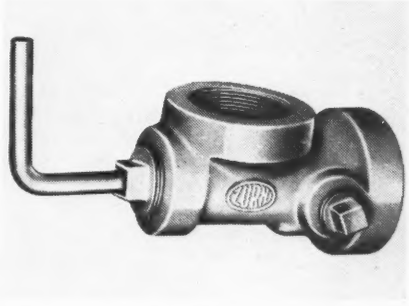
This action is stated to nearly double cleaning efficiency of paper. Necessary voltage is obtained through a compact, self-contained vacuum tube rectifier which converts 115v. a.c. to d.c. current required.

Since unit continues to function as an efficient air filter when de-energized, its operation may be varied to suit dust conditions—as an electrically energized cleaner during winter months when atmosphere is smokier, and as a dry-type filter during summer months. Maintenance is simplified, since low-cost Airmat paper may be quickly replaced when it has accumulated a full dust load.

Grease Flow Tee 8

TO DISTRIBUTE properly the discharge from one or more fixtures through a grease interceptor, a flow control tee has been designed by J. A. Zurn Mfg. Co., Dept. I, Erie, Pa. Such control is stated to be essential to foolproof operation of an interceptor—to guard against overloading due to sudden surges from the sink or other fixtures, and to maintain flow so that interceptor can operate at high efficiency.

Maker states that this control tee, regularly furnished with all of company's Greaseptors, assures that rate of discharge into interceptor will not be greater than its ability to intercept grease. Tee can be purchased separately for use with an old installation, and it is adaptable to any other make or style of interceptor.

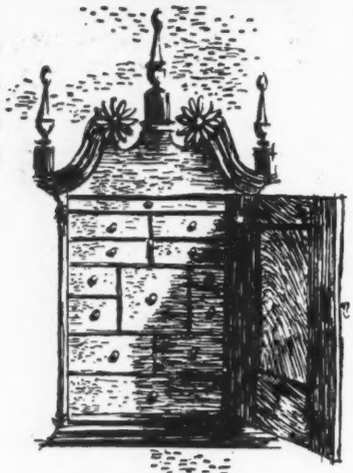


Tee provides for proper venting. A cleaning handle or plunger is incorporated so that solid material which becomes wedged in orifice can be removed by plunging cleaning handle until material has gone through.

WRITE FOR MORE INFORMATION

Food Industries Reader Service now makes it easy for you to follow up the news on new equipment and new materials. Tear-out coupon cards are supplied for your convenience on the special colored page which follows the equipment news section in this month's issue. Enter your requests, fill out and mail cards, and let Reader Service do the rest.

FLORASYNTH



SPICEAROMES

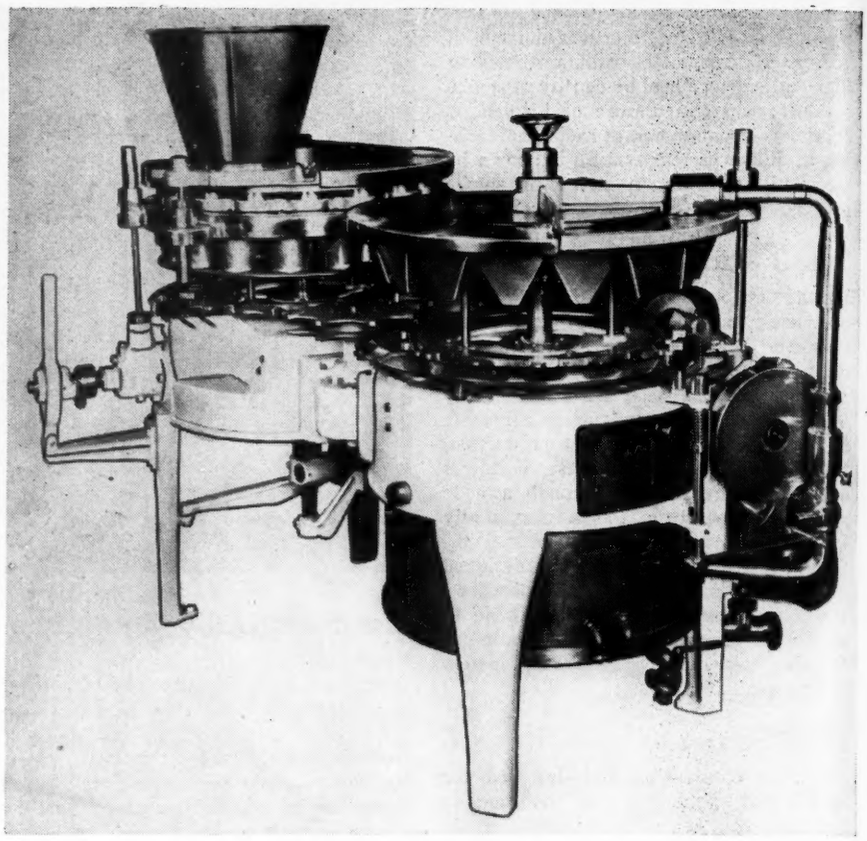
Highly concentrated water miscible flavors ready for use "as is." These high quality Florasynth Spicearomes eliminate the trouble and expense of manufacturing flavor emulsions. They disperse evenly and completely and are efficient and economical because ALL OF THE FLAVOR IN THE SPICEAROME IS IMMEDIATELY AVAILABLE IN THE FOOD PRODUCT BEING FLAVORED.

DILL PICKLE	BLACK PEPPER
DILL PICKLE 'K'	CLOVE
SWEET PICKLE	CUMIN
SPICEAROME 'M'	GARLIC
CATSUP	RED PEPPER

Our Special Research Department is at your service without cost in connection with other or special SPICEAROMES upon receipt of your request.

Florasynth LABORATORIES, INC.

CHICAGO 6 • NEW YORK 61 • LOS ANGELES 13
DALLAS 1 • DETROIT 2 • MEMPHIS 1 • NEW ORLEANS 13
ST. LOUIS 2 • SAN BERNARDINO • SAN FRANCISCO 11
Florasynth Labs. (Canada) Ltd. — Montreal
Toronto • Vancouver • Winnipeg • Florasynth
Laboratories de Mexico S. A. • Mexico City



New Multi-Pocket Filling Machine 9

To HELP MEET the demand for high production speeds, a 15-pocket filling machine for peas, whole kernel corn, beans and diced vegetables is now being produced by Food Machinery Corp., Dept. I, Hoopeston, Ill. An output of 350 No. 2 cans per min. is reported.

Made to handle metal, glass and fiber containers, the unit incorporates two machines, synchronized for simultaneous operation—a brining section and a filling section.

In operation, empty cans are first fed to the briner to get a charge of brine or sauce. From this station, they are transferred to the filler, where a measured amount of the product is received. In the latter section, the cans are supported on a vibratory track which settles the contents as the cans travel to the discharge station. During filling, the top of the can is guarded against splashing or spillage, resulting in a full-weight pack thoroughly brined.

There is a special type stirrer in the supply hopper to maintain the product in a free-running condition, also a no-can-no-fill safety device which prevents loss of product when a can is not in filling position.

Unit Heaters 10

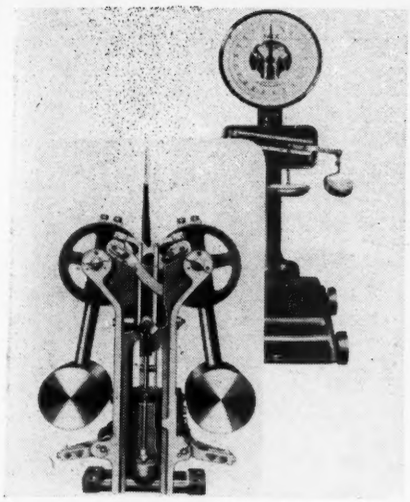
FEATURING cast iron construction in both heat exchanger and combustion chamber, new gas-fired unit heaters are announced by Automatic Gas Equipment Co., Dept. I, Pittsburgh. They are known as Pittsburgh Gas Unit Heaters, Series "C." Cast iron structure was considered best to withstand corrosive effects of combustion gases. Units are in one piece, with extended heating surface fins integral on heat exchanger. Heaters have been designed to consume the correct amount of air to support complete combustion while not permitting an excess of air to lower heating efficiency. This is stated to be accomplished with a special built-in draft hood.

Heater does not depend upon forced draft from fan for either primary or secondary air supply. For this reason there is no variation in air supply to burners from changes in fan speed or louver adjustment. By use of adjustable horizontal louvers, warm air can be directed to any desired level.

A tested and proved safety pilot is used on these heaters to turn off gas automatically if pilot light goes out or burns too low to insure complete ignition. Draft diverter is protection against any possible down drafts through chimney.

Dial Scale Mechanism 11

A BASICALLY NEW dial scale mechanism, the Magnetrol, has been introduced by The Yale & Towne Mfg. Co., Dept. I, Philadelphia. It is stated to achieve a straight-line relationship between platform load and pointer movement without specially filled cams, adaptations to prevent backlash, or delicate adjustments of angular relationships between sectors. Service adjustments are reduced from the usual six or seven to only two. Full but light engagement between pointer rack and pinion is made by means of a permanent magnet. All moving parts are

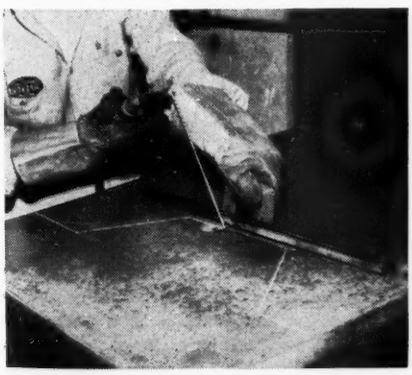


mounted at three fixed centers in a single gray iron casting. They move on ball-bearing surfaces.

Capacity of mechanism under direct loading without any lever system is 25 lb. Application to industrial loads, up to 50 tons, is a matter of lever linkage. Guaranteed accuracy is 1 part in 1000, but accuracies of 1 part in 2000 are obtained, says company. Dial head, which contains a 20-in. reading-line dial chart, can be swiveled through 360 deg. The mechanism is protected from moisture, water and dust by rubber gaskets at dial glass and back plate and by an oil seal at column connection. Locking of mechanism to prevent damage from shock loads is accomplished with a hand lever which secures pendulums in fixed neutral positions and assures that load cannot be communicated to draft bands.

Cutting Electrode 12

For cutting all thin sheet metals, Cuttrode, a smaller diameter metal-cutting electrode is announced by Eutectic Welding Alloys Corp., Dept. I, N.Y.C. Designed for use on stainless, bronze, nickel, and copper, this new 3/32-in.-dia. electrode is intended for those having small a.c. welding machines. Model to cut cast iron, stainless, bronze, aluminum and other metals is also available in size $\frac{1}{8}$ in. for medium thick cutting; $\frac{5}{32}$ in. for chamfering and cutting heavy cast iron; and $\frac{1}{4}$ in. for extremely



heavy parts. Electrode focuses its energy on a concentrated area. Maker states that in size 3/32 in., it may be used with a guide or rule on thin sheet for even, straight cuts of knife-like precision.

Stop Losses from Insects

...Use the "ENTOLETER" Continuous Control System for Plant and Product Cleanliness

Operating records prove that "ENTOLETER" Continuous Control destroys all forms of insect life. In addition to this service, mills and food plants are reaping other benefits from the "ENTOLETER" system. Here are three positive advantages.

1 KILLS ALL INSECT LIFE

Now, more than ever, your plant and products need the "ENTOLETER" system of continuous insect control. It helps you to avoid waste of scarce food materials . . . to protect product ingredients . . . to insure the high standards of your products.

2 ESSENTIAL IN FRAGMENT CONTROL

The "ENTOLETER" system is being used successfully to reduce fragment count. Send for a copy of our latest bulletin describing methods of application.

3 AIDS PRODUCT UNIFORMITY

Food plants and flour mills have found that the "ENTOLETER" system offers an excellent means of blending flours, mixing ingredients in compounds and improving vitamin distribution. This, alone, more than justifies its cost.

For Bulletin on "ENTOLETER" Continuous Insect Control System, write to ENTOLETER DIVISION, The Safety Car Heating and Lighting Co., Inc., P. O. Box 904, New Haven 4, Connecticut.

ENTOLETER
CENTRIFUGAL MACHINES
REG. U.S. PAT. OFF.

CONTINUOUS INSECT CONTROL SYSTEM

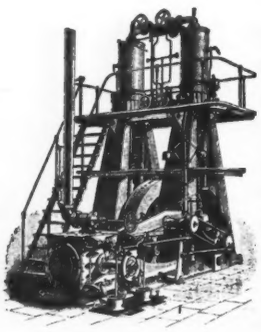
Hudepohl Breweries Use

FRICK

Refrigeration

60 YEARS!

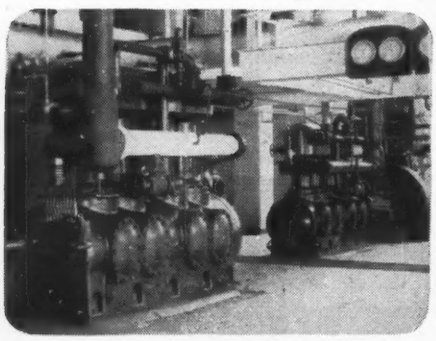
Frick ammonia compressors as built in the Eighties and Nineties were primitive machines by today's standards. But they were remarkably dependable: one of those installed in the Hudepohl Breweries at Cincinnati ran 57 years, another 52, and two others 45!



Old and New Frick Refrigerating Machines at Hudepohl Breweries

Naturally, Hudepohls believe in Frick Refrigeration. Their fine new engine room contains the two big Frick 4-cylinder machines illustrated.

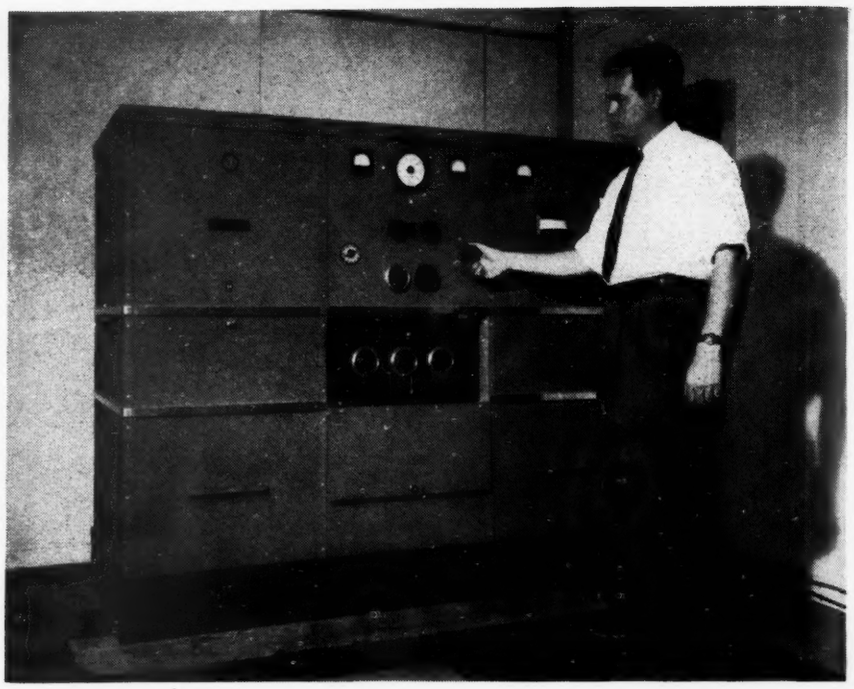
You'll get the last word in reliability when you specify Frick Refrigeration.



DEPENDABLE REFRIGERATION SINCE 1882

FRICK CO.

WAYNESBORO, PENNA., U.S.A.

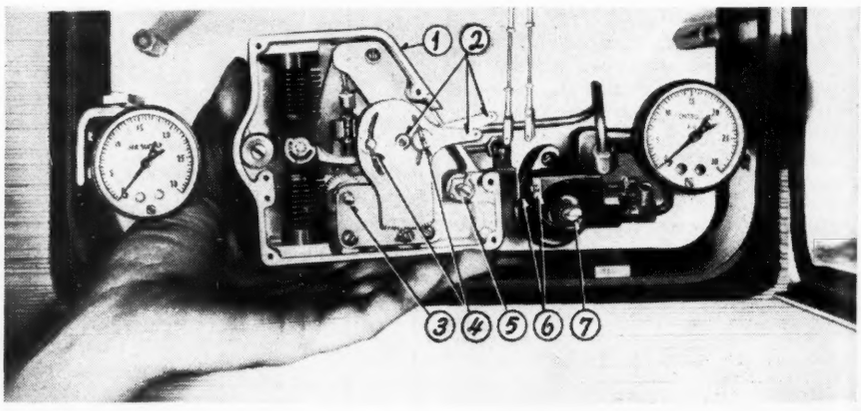


Self-Contained Centrifuge for Research . 13

CHARACTERIZED as a research tool for centrifugal purification and molecular-weight determination of particles in larger molecular size range, Spinco Ultracentrifuge offers a unified design housed in a single enclosure and ready for full operation with connection of power lines and cooling water. Unit is made by Specialized Instrument Corp., Dept. I, Belmont, Cal.

Essentially, machine consists of means for driving various types of rotors at adjustable constant speeds up to 70,000 rpm., together with associated controls and related apparatus for measurement and observation of conditions relative to sample under observation. These include: An optical system of refractive index type with viewing screen for studying material being centrifuged; a high-intensity H6 mercury-arc light source; a camera for permament records—either automatically or manually operated; high-vacuum pumping equipment for evacuating rotor chamber to a vacuum below 10^{-3} mm. Hg; a refrigerating system for maintenance of reduced rotor temperatures; and complete controls and safety interlocks. Maximum centrifugal force which can be exerted on sample is 260,000 times gravity.

Developed by Dr. E. G. Pickels, centrifuge is seen as particularly adaptable for work on particles from 1 micron down to a few thousandths of a micron—range covers major virus and protein groups.



Flow Instrument Pneumatic Control Mechanism 14

A TOTALLY NEW pneumatic control mechanism is now incorporated into all flow controlling instruments manufactured by Fischer & Porter Co., Dept. I, Hatboro, Pa. Housing for new unit consists of a one-piece die casting with all component parts maintained in a positively fixed relationship. Important working parts are made from precision castings or heavy stampings, precision trimmed and carefully inspected to assure complete interchangeability. Entire assembly may be removed from control instrument for cleaning or repair, without disturbing process, by simply flicking transfer valve to service position, disconnecting a single air line, and removing four screws. A minimum of tubing connections is stated to eliminate air leakage troubles. Alignment of pen and index is certain through-

out range, since both index and input links swing on a common center. Valve action is easily reversible without altering link relationships. Designated in illustration are: (1) Housing, (2) input and control index levers, (3) control shaft, (4) removable control assembly, (5) reset speed adjustment, (6) automatic-manual transfer valve and (7) 0-200 percent throttling range adjustment.

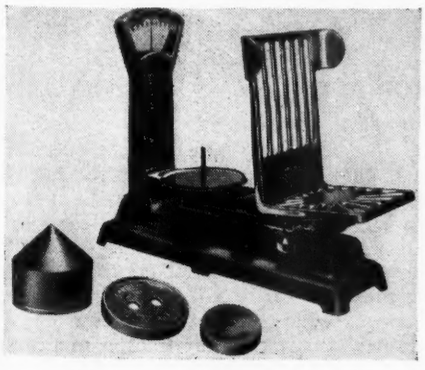
All-Steel Ramp 15

FOR LOADING AND UNLOADING refrigerator cars with a fork truck at railroad sidings, an all-steel 15,000-lb. capacity ramp has been developed by Elizabeth Iron Works, Dept. I, Newark, N. J. Known as Refrigerator Ramp, it is shaped to fit into narrow doors of refrigerator cars, and is picked up and transferred to position by fork lift. Pick up of ramp is by means of lift handles which drop flush with riding surface when ramp is in use. Truck

operator positions ramp to span gap between car and platform, withdraws forks, drops handles, then inserts locking pins which secure ramp in position. A two-position fixed door stop assures snug fit of ramp against wide or narrow refrigerator car door sills. Made in two sizes. Span gaps—15 to 32 in. and 24 to 44 in.

Produce Scale 16

BUILT expressly for the job of accurately weighing and handling all kinds of produce, a new fruit and vegetable bagging scale is announced by Exact Weight Scale Co., Dept. I, Columbus, Ohio. Scale features a special commodity holder, tilted and equipped with guard to hold bags, dial in direct line of the operator's vision, shatterproof dial glass, and short platter fall for speed of operation. Unit is designed for 5, 10 and 15 lb. consumer bags.



A PROVEN AND PROFITABLE METHOD OF ELIMINATING LOSSES DUE TO MOISTURE

Protection for food products from point of manufacture to the ultimate consumer against damaging moisture inside the package and shipping container is now economically practical with Desiccite — the highly efficient, low cost drying agent. *Desiccite* #25* is a moisture adsorbent in small pellet form that picks up water from the air. It has no odor or taste and is absolutely safe and inert.

Bags of Desiccite placed inside regular shipping containers and consumer packages produce a desert-dry atmosphere. If you have a product that is subject to damage by moisture, "dry-pack" with *Desiccite* #25 so that it will reach the ultimate consumer at the same quality level of freshness, crispness and taste that it leaves your plant.

FOR FURTHER INFORMATION AND A SAMPLE OF DESICCITE #25 WRITE TO YOUR NEAREST DESICCITE DISTRIBUTOR:

- Prior Chemical Corporation—New York City.
- Eaton Chemical & Dyestuff Co.—Detroit.
- Gulf Coast Industries, Inc.—Corpus Christi.
- L. H. Butcher Co.—Los Angeles, San Francisco, Portland, Seattle

Gentlemen:

☐ We are interested in securing more information about Desiccite #25.

☐ Please send us complete information and a sample of Desiccite #25.

Firm Name_____

Attention_____

Street_____

City_____ Zone____ State_____

DESICCITE* #25

Filtrol products are available throughout the world

write for name of agent in your country
ecrire pour le nom de l'agent de votre pays
escribir pidiendo el nombre del agente en su país

Filtrol CORPORATION

General Offices: Los Angeles, Calif.
Plants: Vernon, Calif. Jackson, Miss.

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WORLD'S LARGEST MANUFACTURER OF ACTIVATED ADSORBENTS

LOOK TO THE LEADER FOR THE

PEERLESS

CHAMPION

PEERLESS DEEP WELL TURBINE PUMP FOR SMALL DIAMETER WELLS

Squarely meets the need for turbine pump utility, stamina and reliability for 4" wells and larger

Here is the Peerless pump that successfully and completely fills the gap often found between domestic water systems and the larger deep well turbine pumps. The Champion is a powerful water producer from small diameter deep wells; it provides unsurpassed water lifting performance for a host of commercial and industrial uses requiring moderate gallonage and a clean water supply. Read the specifications below. If you find that the Peerless Champion turbine pump generally meets the water requirements of your business, write for full details, described and illustrated in a new Peerless engineering Bulletin. Do it today!

PEERLESS CHAMPION SPECIFICATIONS:

CAPACITIES: Up to 5000 gals. per hour

LIFTS: Up to 200 Feet

PRESSURES: Up to 90 lbs.

DRIVES: Available with electric head, right angle geared head for use with horizontal driver or Vee-belt drive.

WATER LUBRICATED: OPEN LINE SHAFT CONSTRUCTION

FOR 4 INCH DIAMETER DEEP WELLS AND LARGER

TOP FLIGHT PEERLESS QUALITY CONSTRUCTION THROUGHOUT

WRITE FOR BULLETIN B-200

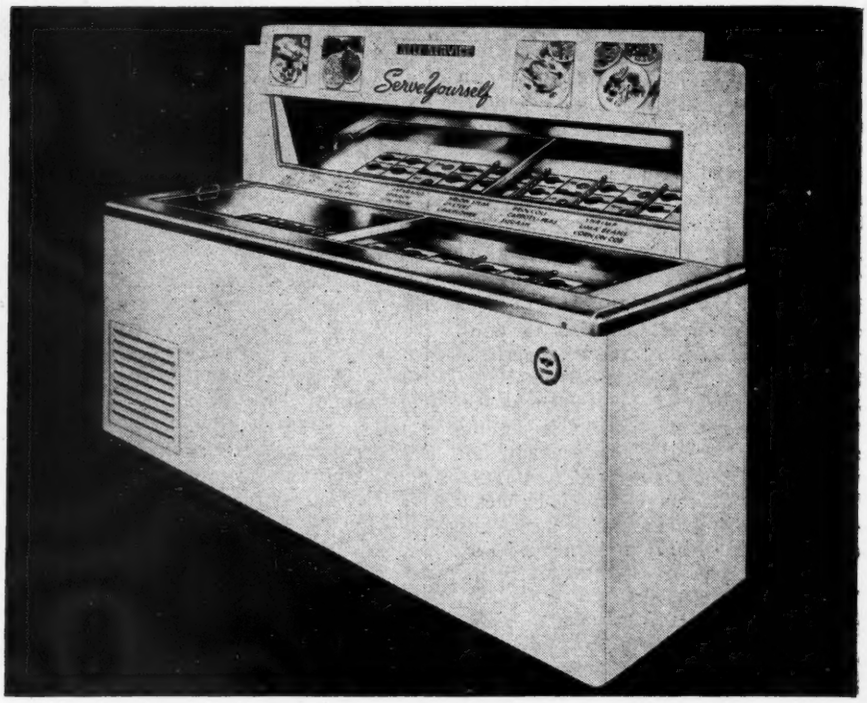
Contains complete pump description, plus valuable engineering and water pumping data. Fully illustrated.

PEERLESS PUMP DIVISION

FOOD MACHINERY CORPORATION

Factories: Los Angeles 31, Calif.; Indianapolis, Ind.

District Offices: New York 5, 37 Wall Street; Chicago 40, 4554 No. Broadway; Atlanta Office: Rutland Building, Decatur, Georgia; Dallas 1, Texas; Fresno, California; Los Angeles 31, California.



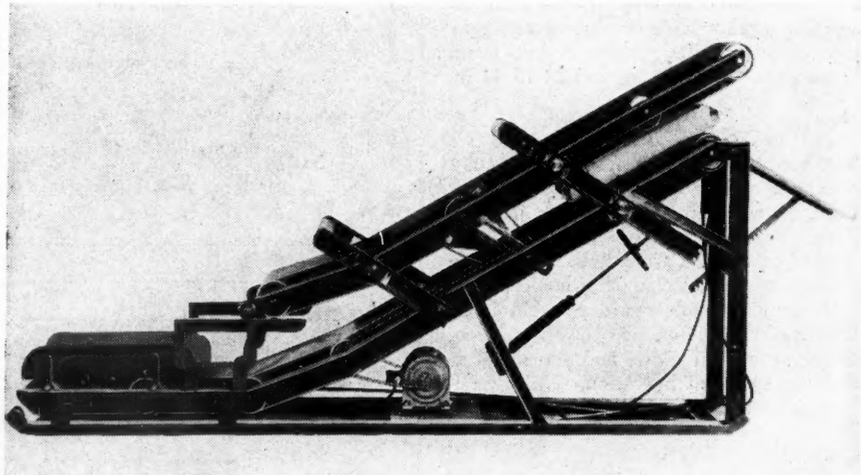
Frozen Food and Ice Cream Display Cabinet 17

NEW point-of-sale food merchandiser comprises 18-cu. ft. self-service frozen food and ice-cream display cabinet. Unit is supplied by the Frigidaire Div., General Motors Corp., Dept. I, Dayton, Ohio.

Four illuminated food pictures are a special feature of the cabinet. Mounted in a full-length, eye-catching superstructure, color pictures show foods with three-dimensional effect through a new photographic process. An angled illuminated mirror is placed across the entire white enamel top panel to accent the entire display. Easily changed price cards are located just beneath the mirror.

Covering the entire food compartment are two glass doors. Ball bearing rollers and metal guides provide a smooth glide for the doors, which may be quickly removed for rush hour service. Non-fogging, the doors assure full vision of the interior at all times. To absorb shock and seal in cold, the glass is mounted with rubber gaskets in stainless steel frames.

Dimensions: Length 93 in., width 29 in., height 37 in.



Electric Motor-Driven Bag Flattener 18

TO PRODUCE a flat, smooth bag which piles more easily and stays piled better, new bag flattener is announced by Flexoveyor Mfg. Co., Dept. I, Denver. It is powered by an electric motor which drives endless steel coil springs running over grooved steel rollers. Through a rocker arm connection between hugger boom and lower conveyor, a kneading and pressing action is applied by hugger boom, removing air from bag and evenly distributing contents.

Points at which hugger boom is attached to rocker are adjustable, thus making it possible for flattener to handle a bag of practically any thickness beyond that allowed by normal floating action of hugger boom. In addition to bags being flattened as they go through this machine, they are raised above floor approximately 4 ft., facilitating transfer to a con-

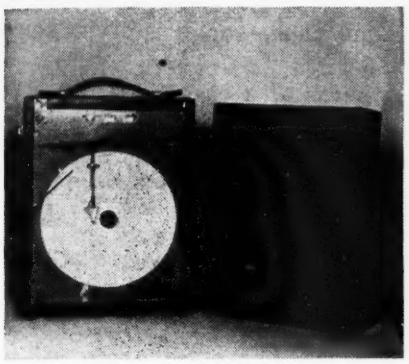
veyor system, stacking, or loading into trucks and box cars.

Unit is available with swivel casters or pneumatic tires, making it portable; or it may be used on skids, as shown.

Current Recorder 19

DEVELOPMENT of a new, portable, d.c. recorder for measurement of micro currents and voltages, wherein exact range required may be individually selected by the user, is announced by Wallace & Tiernan, Belleville, N. J. Minimum full scale range of instrument is 0 to 0.1 milliamp., and maximum is 0 to 12 amp. Sensitivity is 1 part in 1000.

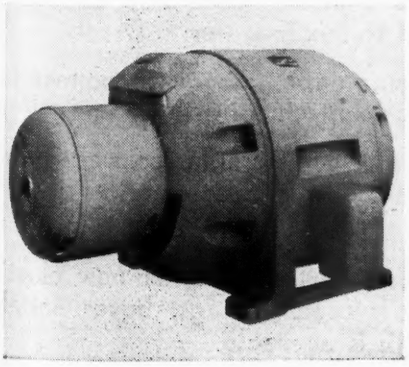
Of moving-magnet, interchangeable-coil type, recorder is designed for con-

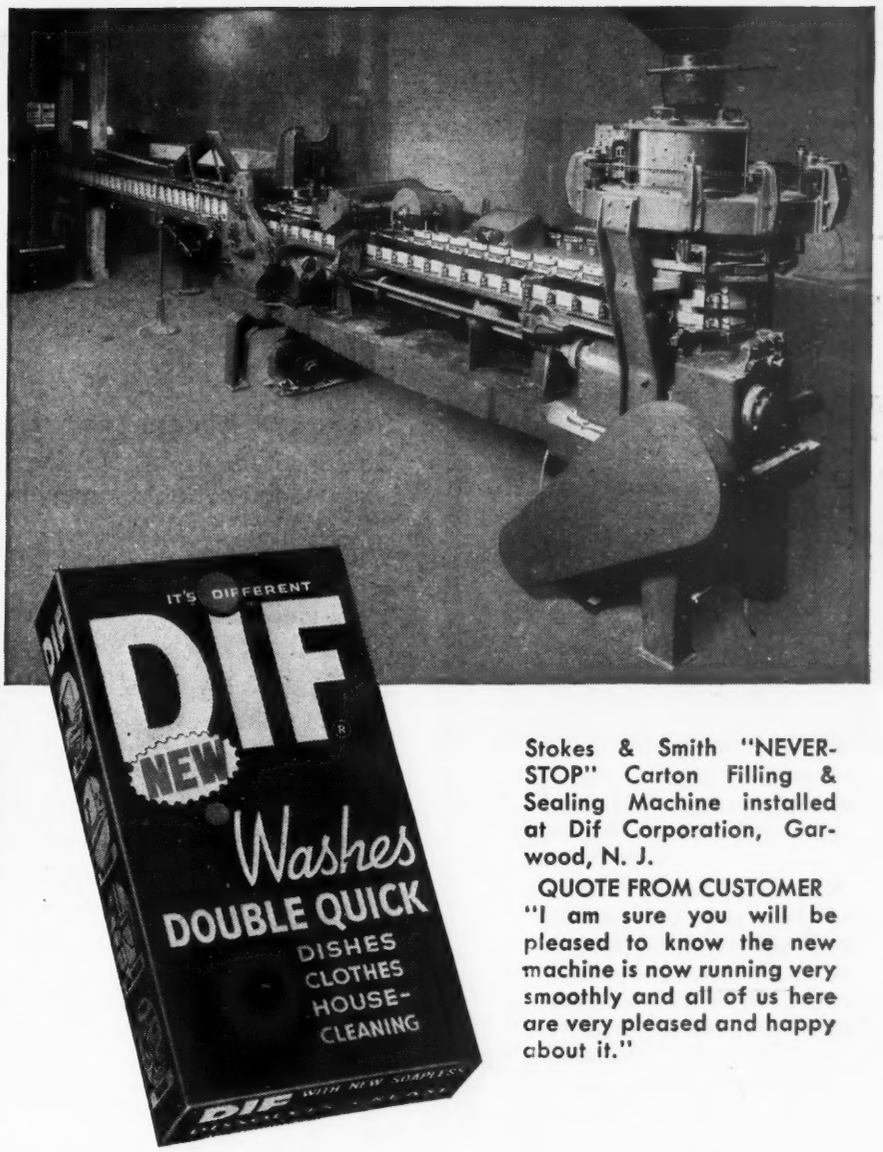


tinuous duty. Bearing friction and friction between pen and chart are virtually eliminated. Eight different coils are available, and each is adjustable over a range of 11.5 to 1. Zero on scale can be suppressed up to 80 percent. Chart, of circular 24-hr. type, is driven by a conventional synchronous motor consuming approximately 5w.

Motors and Generators 20

GENERAL-PURPOSE Tri-Clad, high-speed synchronous motors and generators in the "900 series" frame sizes have been announced by General Electric Co., Dept. I, Schenectady, N. Y. Motors in this new line are available in standard ratings from 20 hp. to 1,000 hp. at 60-cycle speeds of 514 to 1800 rpm., in either two-phase or three-phase types. Generators are available in ratings from 12½ to 1250 kva. Of drip-proof construction, the motors incorporate the usual Tri-Clad features. Direct-connected and belt-driven exciters are available for all ratings.





Stokes & Smith "NEVER-STOP" Carton Filling & Sealing Machine installed at Dif Corporation, Garwood, N. J.

QUOTE FROM CUSTOMER

"I am sure you will be pleased to know the new machine is now running very smoothly and all of us here are very pleased and happy about it."

This machine feeds the cartons from a supply—bottom seals, fills and top seals—60 to 70 packages per minute all on the one machine. Continuous motion—High production.

OTHER STOKES & SMITH MACHINES

FILLING • SEALING
PACKAGING
WRAPPING
"SPEEDS TO SUIT YOUR NEEDS"
Write for complete information

STOKES & SMITH CO.

PACKAGING MACHINERY — PAPER BOX MACHINERY

4911 Summerdale Ave., Philadelphia 24, Pa., U. S. A.

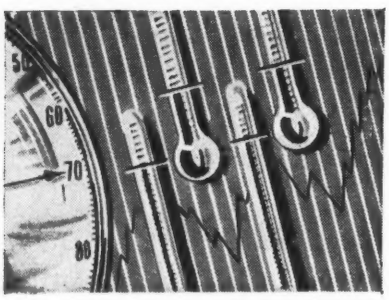
UPACO

THE UNION PASTE COMPANY
1605 HYDE PARK AVENUE
HYDE PARK MASSACHUSETTS

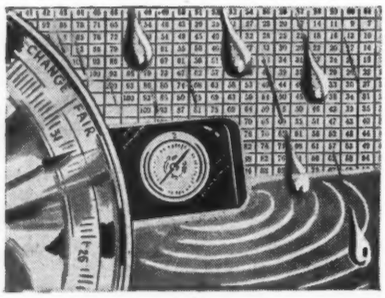
UPACO ADHESIVES . . . . . *"TAILORED" TO SPECIFIC REQUIREMENTS*

time

temperature



humidity



BOTTLE LABELLING

Standard Recommendations

Dextrine type — fast setting, tacky, for fully automatic, and new semi-automatic machines.

Starch type — fast setting, medium tack, for old style semi-automatic machines.

Semi-Iceproof — for label retention in coolers. Will not resist handling while wet.

Iceproof — for label retention in coolers. Will resist handling while wet.

Specialty Recommendations

Waterproof — Will meet government specs. for maximum waterproofness. Resin emulsion type.

Extra high speed — Dextrine type with very high solids and low viscosity. Very fast.

Can Labelling

Cold Pick-up Gums — very heavy dextrine type for running cold on cold or normal cans.

Hot Pick-up Gums — with wide range for full use on cans of different temperatures.

Lap Pastes — Smoothest running types available.

Pick-ets — Findley's famous pick-up gum pellets available through us in the East.

Carton Sealing

Several commercially accepted types available. Our recommendation would depend on type of machine used, and would take into account any existence of short pressure belts, hard finish or lined boards, etc.

Case Sealing

Full-automatic — quick setting type allowing for maximum closure strength on removal from pressure belts. Shipped heavy enough for good dilution, while not so heavy expensive labor is needed to mix in water.

Semi-automatic — same as full-automatic, though recommendations may vary according to machine.

Hand-application — both thin and heavy, light colored types available that can also be used for labelling.

Specialty Adhesives

For Cellulose Films of all types, as well as all other new plastic type package materials and foils used in bags, boxes, labels, and cartons. A COMPLETE LINE is available.

CATALOGS, BULLETINS

This digest of manufacturers new publications is offered by FOOD INDUSTRIES Reader Service as a convenience for executives. The editors feature catalogs, data sheets and technical pamphlets likely to interest purchasing agents, superintendents, packaging men and food technologists.

Food Plant Equipment

Bottle Labeling 51

Discussed in 6-page illustrated bulletin are labeling methods, complete range of bottle label adhesive bases, and recommendations for design, selection and handling of paper labels.—Paisley Products, Inc.

Tramp Iron Removal..... 52

Permanent non-electric magnetic separators are described in 8-page Catalog 12. Specifications on weights, sizes and strengths, also tables on operating capacities, are given for magnetic pulleys, drums, pneumatic line assemblies and pipeline traps. Illustrations and drawings are included.—Eriez Mfg. Co.

Blow-Off Valves 53

Aid in selection of blow-off valves for desired pressure, operating method and condition, and ASME code requirements is offered in 4-page Bulletin E-120. Dimensions, capacities and other data are presented in tabular form.—Everlasting Valve Co.

Acid-Proof Condensers 54

Diagrams and description of acid-proof tantalum condensers for condensation or distillation of corrosive solutions are provided in 4-page Technical Data Bulletin 3.503. Condenser consists of a tapered tantalum tube in a steel water jacket.—Fansteel Metallurgical Corp.

Chemical Pumps 55

Capacity-pressure chart for chemical pumps is featured in 4-page Bulletin 484. Illustrations are included of Simplex pump for the 1000-9500 psi. range.—Milton Roy Co.

Package Boiler 56

Ten sizes, from 15-80 hp., Little Giant boilers are illustrated and described with dimensions in 4-page folder.—Union Iron Works.

Pulleys 57

New list prices and descriptions of molded cast iron pulleys are contained in 10-page Catalog 60. Dimensions of solid and split iron, single and multiple arm pulleys are included.—Pyott Foundry & Machine Co.

Liquid Coolers 58

Beverage coolers and milk coolers are detailed and pictured with full and cutaway views in bulletins CB-248-8 and CM-248-8 issued by —Norge Div., Borg-Warner Corp.

Cane Mud Filters..... 59

For sugar refineries, 16-page illustrated Bulletin 215 is offered, describing cane mud filters, reported to cut losses from inversion and filtering. Other applications are in salt and pharmaceutical processes.—Oliver United Filters Inc.

Cracker Sprayer 60

High-speed oil-spraying machines for crackers, which refilter the oil, are pictured and described with dimensions in Bulletin 120. Also offered by company are Bulletins 103 and 105 concerning a new endless-belt turntable and automatic belt guiding device.—J. W. Greer Co.

Electric Motors 61

"Handy Guide for Quick Selection of Electric Motors", 12-page bulletin, provides specifications on squirrel-cage induction motors, application data, range of sizes and speed torque curves on synchronous wound rotor and d.c. motors. Applications of gearmotors, multi-speed induction motors and motor controls are also discussed.—Allis-Chalmers.

Heat Exchangers 62

Shell and tube heat exchangers, coolers, heaters, decalorators, steam jet ejectors and allied equipment are pictured and described in 25½ x 19½ broadside.—Ross Heat & Mfg. Co., Inc.

Stainless Equipment 63

Illustrations showing finished equipment custom-manufactured to meet special applications are shown in 4-page Bulletin No. 51—Jensen Machinery Co., Inc.

Liquor Pumps 64

Range of applications with Type "L," "LS," and "A" liquor pumps, including pumping of erosive or corrosive liquids, is covered in 6-page accordion folder, Bulletin 245.—Warren Steam Pump Co.

Corrosion-Resisting Alloys 65

Information on new nickel-molybdenum and nickel-molybdenum-chromium alloys, Chlorimet 2 and 3, with recommendations for use, also charts on resistance tests, is presented in 8-page Bulletin 114.—The Duriron Co., Inc.

Sugar Handling 66

Cane sugar mill machinery is comprehensively covered in 88-page book, No. 2240, discussing cane handling, juice handling and maceration, bagasse, bulk sugar and bagged sugar handling, sugar drying, and power transmission machinery.—Link-Belt Co.

Condensate Return System..... 67

New CBA system for condensate return to high pressure boilers is described in 4-page Bulletin 3250-1.—Cochrane Corp.

Fractional HP. Brake..... 68

Announcement of Series X-60 fractional hp. a.c. or d.c., brake, for floor mounting, is made in Bulletin 605-6X. Torque range is from 1½ to 500 lb./ft.—Stearns Magnetic Mfg. Co.

Bottle Cleaner 69

Medium-sized bottle cleaner, for submerged soaking time from 7½ to 10 min. is described in 8-page Bulletin 90. Cutaway views and diagram show operation of soaker. Dimensions are given.—Barry-Wehmiller Machinery Co.

Stainless Steel Kettle..... 70

Kettle for melting, mixing and cooling food products is described in 4-page bulletin.—Wegner Machinery Corp.

Wrapping Machinery 71

Cellophane wrapping machine, Model F, suitable for fruit, vegetables and meats, is described in 4-page folder.—Package Machinery Co.

Fastenings 72

Non-ferrous and stainless steel fastenings are listed in 32-page stock catalog. Sections cover nuts, screws, washers, rivets and accessories. Graphic index shows types carried in stock. Blueprint line drawings and tables show dimensions.—The H. M. Harper Co.

Air Filter 73

Electro-PL, a dry-type electrostatic air filter, is described with dimensions, drawings, installation data, and suggested specifications, in 12-page Bulletin 257.—American Air Filter Co., Inc.

Wood Coating 74

Waterproof corrosion-resistant coating for wood tanks, floors, racks, tables and fume hoods is described in Bulletin M-2. Maker states Carbo-Kote films are specially designed to stand high temperatures and are long wearing.—Carboline Co.

Variable Speed Motors..... 75

Operating features and applications of new model Varidrive motor are presented in 16-page 4-color illustrated bulletin.—U. S. Electrical Motors, Inc.

Weighers and Fillers..... 76

Equipment for weighing and filling dry products in all types of containers, from milligrams to 100 lb., in semi-automatic and automatic models, at output speeds of 10 to 150 per min., is covered in 8-page Catalog 48.—Weigh Right Automatic Scale Co.

Steel Scaffolding 77

Tubular steel scaffolding with "TubeLox" couplings are described in 4-page illustrated Bulletin G-200. Also discussed are steel sidewalk bridges, scaffolding machines and safety platform and extension ladders.—The Patent Scaffolding Co., Inc.

Centrifugal Pumps 78

Worthington Pump & Machinery Corp.—12-page Bulletin W-305-B1 contains specifications, typical section drawings, ratings, dimensions and photographs on various types of centrifugal pumps. Information on how to select a pump is also given.

Chocolate Enrober 79

National Equipment Corp.—4-page illustrated folder presents features of company's chocolate enrober. Operation of the machine is described and sizes are listed.

Rotary Drier 80

Louisville Drying Machinery Co.—6-page illustrated Bulletin 52, presents information on the construction and operating features of company's rotary drier. Standard or special designs may be selected in accordance with user's specific requirements.

Sausage-Making Machine 81

Mixers, Inc.—Pocket-size leaflet from this company presents features of a mixer for making sausage. Machine is illustrated and

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operation described. Uses for other products are also given.

Can Washer 82

Expanding, multi-fingered scrubber, the Centri-flo can washer, is described in leaflet. Rubber washer will conform to irregular shaped cans of any size.—Gordon Johnson Co.

Air Conditioning 83

Seven sheets, punched for insertion in notebook, describe with specifications and dimensions air conditioning equipment, unit heaters and evaporative condensers.—Worthington Pump & Machinery Corp., Air Conditioning & Refrigeration Div.

Flash Pasteurizer 84

Typical flow diagram for juice processing is feature of 6-page foldover, No. P-147, on high temperature flash pasteurizer. Applications are for juices of citrus fruit, tomatoes, apples, grapes and pineapples.—Walker-Wallace, Inc.

Plant Supplies

Rat Control 85

Electric rat trap, compact and completely automatic, for use on 110v. is pictorially displayed in 6-page accordion folder, punched for insertion in notebook.—LFC Guard Corp.

Sealing and Lubricating..... 86

Valve lubricants; thread, line, gasket and anti-seize compounds for many types of tubing and piping systems are described in Catalog 909.—Parker Appliance Co.

Synthetic Organic Chemicals..... 87

Revised edition of "Physical Properties of Synthetic Organic Chemicals" is a 12-page condensed guide for users of these products. Form 6136 contains information on applications and physical properties of more than 185 chemicals. Data is presented in tabular form.—Carbide & Carbon Chemicals Corp.

Chemical Manual 88

"Products for Foods, Beverages and Feeds" is 45-page indexed book which gives formulas, preparation methods, physical and chemical properties and general discussion of 57 processing and nutritional products from alginate jellies to vitamins. Illustrations and data curves are included.—Chas. Pfizer & Co., Inc.

Pan Glaze 89

"How to Use DC Pan Glaze" is 4-page folder giving detailed instructions on proper cleaning of pans and correct methods in applying and curing glaze.—Dow Corning Corp.

Benzoates 90

Data on preserving, together with a resume of federal and state laws on the use of benzoates in foods and beverages, are contained in new 24-page edition of "A Treatise on Benzoates".—Seydel Chemical Co.

Canning Plant Cleaning..... 91

Oakite Products, Inc.—20-page pocket-size booklet covers ways and means of improving canning plant sanitation procedures in line with newly developed cleaning materials and methods.

Materials Handling

Grain Car Unloader..... 92

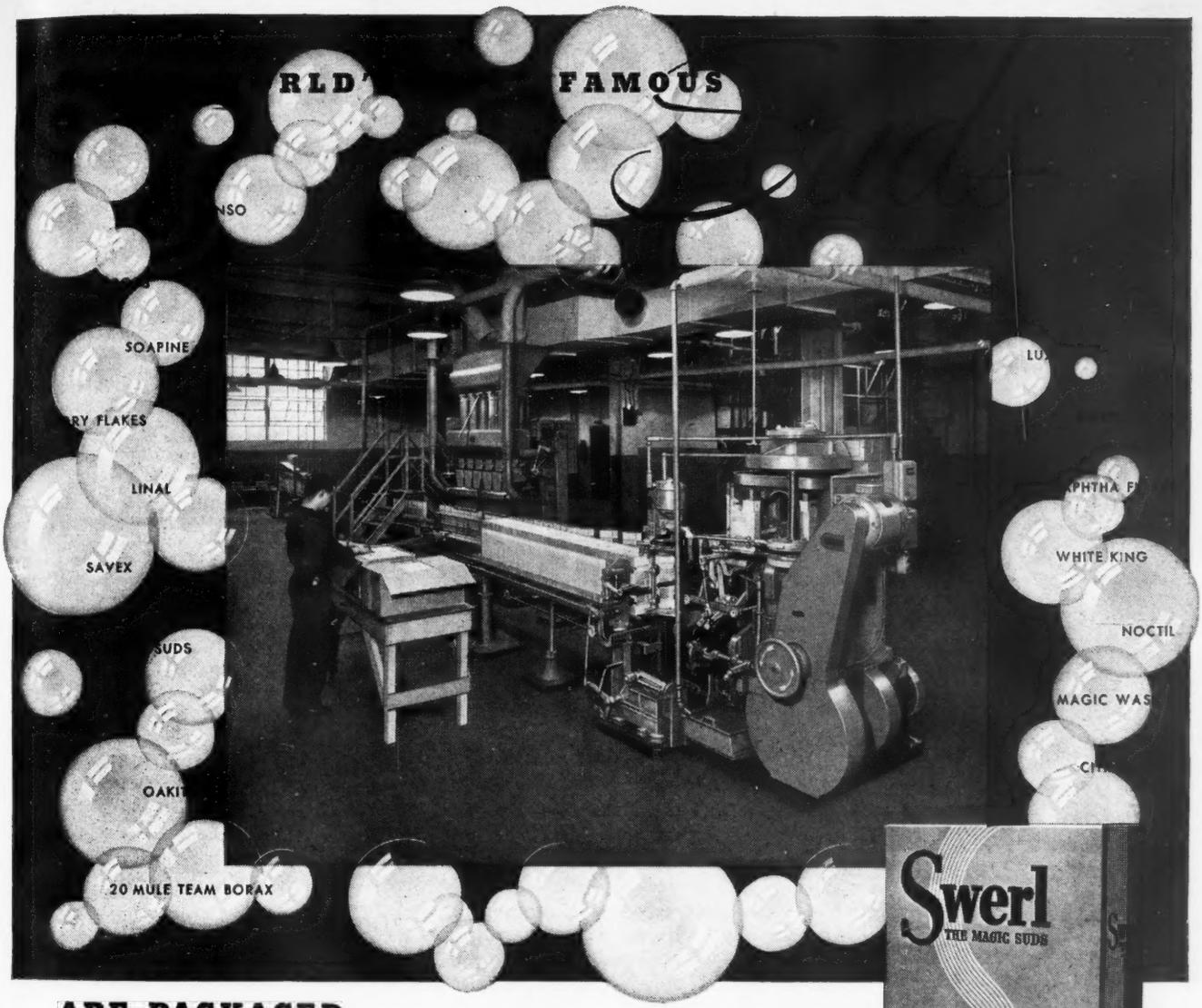
Handling all sizes and types of box-cars, with unloading capacity of 7-10 cars per hr., grain car unloader is described in 8-page fully illustrated folder, No. 2294.—Link-Belt Co.

Pallet and Rack Combination..... 93

For unwieldy sacks, packages and odd-shaped containers, Uni-Raks, a pallet and rack combination for high tiering, is described in new leaflet.—Material Handling Equipment Co.

Pallet Systems 94

Uses and recommended designs for pallets are covered in 20-page Bulletin P-673. Illustrations and charts on hand truck mechanisms, mechanical and hydraulic lifting units, and pallet trucks are included. Also discussed is the Worksaver, power-hand truck.—Yale & Towne Mfg. Co., Phila. Div.



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Control Equipment

Industrial Thermometers 95

William Hiergesell & Sons—4-page Bulletin 208 lists revised specifications of company's ASTM thermometers. Ranges, graduations and lengths are given in table form. Prices are included.

Spectrophotometer 96

Wilkens-Anderson Co.—8-page Bulletin B-211 describes Junior spectrophotometer with interchangeable scales. Exact color specifications can be established in vitamin, food and culture growth studies. Prices are given.

Control for Boiler Draft Fans..... 97

Electric Machinery Mfg. Co.—20-page booklet 4400-TEC-1078, on new speed control for boiler draft fans with controlled magnetic drive, carefully details principles of operation. Including graphs, diagrams and installation pictures, booklet describes how unit was designed to combine wide range with rapid and precise control.

Miscellaneous

Air Drier 98

Application of air drier is diagrammatically shown, and method of selection for air conditioning system is given in this 2-page folder, third in a series of Data-grams.—Bryant Heater Co.

Venting Steam Lines..... 99

Advantages of air vents on high pressure steam lines are covered in text of 4-page Bulletin 275. Installation diagrams and dimensions are given.—Sarco Co., Inc.

Tape Dispenser 100

For packaging operations, the predetermined tape length dispenser, covered in 12-page booklet, is reported to effect savings in labor and material. Reference chart on paper, cloth, acetate fiber, and cellophane tapes is included.—Industrial Tape Corp.

Machinery Steel 101

Figures showing strength, machinability rating, typical analysis, mechanical properties, and hardness at various tempering temperatures of Rytense AA, a medium carbon manganese free-cutting machinery steel, are contained in 4-page illustrated bulletin.—Joseph T. Ryerson & Son, Inc.

Fittings and Flanges.....102

New approach to flanged-piping problems is illustrated in 4-page Bulletin 483. Included are drawings, dimensions and prices of new type fittings and flanges.—Taylor Forge & Pipe Works.

Hand Tachometer 103

Versatile new hand tachometer covers ranges of 2-10,000 rpm., or 20-100,000 rpm., by use of adapters. It is described in 4-page Bulletin 103.—Metron Instrument Co.

Flour Enrichment 104

VextraM, flour enrichment mixture, is described, and recommendations for various flours given, in data sheets, No. 88-SM. Prices are listed.—Winthrop-Stearns Inc.

Roofing Material 105

Soft-temper Monel roofing sheet, for resistance to smoke, industrial fumes, wearing action of ice and gritty dust, and extremes of temperature, is described with dimensional drawings in 24-page illustrated booklet, "One Metal Roof . . . For the Life of Your Building".—International Nickel Co., Inc.

Welding Electrodes 106

Revised edition of Bulletin 68-C on resistance welding electrodes and alloys includes in tabular form physical properties and applications of electrodes of many alloys. Also included in this 24-page booklet are specifications on newly designed water-cooled ejector-type holders.—Ampco Metal, Inc.

FOOD TECHNOLOGY

NEW DISCOVERIES AND INVENTIONS

FERMENTATION

Wine Fermentation

SECONDARY fermentation based on the survival of yeasts are negligible in light sweet wines containing 220 ppm. or more SO_2.

Table wines were grown, fermented to dry, pasteurized and aged. They were then ameliorated to 6 deg. Brix and less than 14 percent alcohol by volume. SO_2 was used in amounts ranging from 50-350 ppm. as a preservative. Each wine was innoculated with *Saccharomyces ellipsoideus* and incubated at 86 deg. F. Survival of the yeast was observed by the plate-count method at subsequent dates.

In the wine containing 50 ppm. SO_2, yeasts increased approximately 134,000 percent in 2 days. In the same wine containing 100 ppm. SO_2 the increase was 18,000 percent. After 2 days 99.9 percent of the yeasts were eliminated in the wine containing 150 ppm. SO_2 and completely eliminated in that containing 200 ppm. or more SO_2.

Digest from "Possibilities of Secondary Fermentation in Light Sweet Wines," by H. Yang and E. Wiegand, presented at ACS meeting, Portland, Ore., Sept. 14, 1948.

STARCH

Sweet Potato Starch

APPLICABLE to the production of all starches, but particularly to sweet potato starch, a process has been patented that requires but 4 hr. as against 72 hr. in prior methods. A two-stage countercurrent screening system insures rapid removal of starch from pulp with a minimum quantity of water.

The process is continuous. Potatoes are washed, sliced and ground in some form of attrition mill. During and after grinding, the pulp mass is diluted with starch milk from the countercurrent screening system. This slurry, rendered alkaline by the addition of lime water, is treated in a continuous solid-bowl centrifugal separator where most of the solubles are removed. Pulp and starch are diluted with starch milk to a suitable consistency for treatment on the first countercurrent screening system. The separated pulp is again mixed with starch milk and subjected to a second grinding and screening operation. The pulp is finally pressed, dried and used as cattle feed. The starch milk from the first screening system is thickened and partly purified in centrifugal separators, bleached, vacuum-filtered, centrifuged, dried and pulverized.

Digest from U. S. Patent 2,443,897, issued June 22, 1948, on an application dated March 23, 1944, to G. M. Dexter, Scarsdale, N. Y., and F. H. Thurber, Washington, D. C.; said Thurber assignor to the United States of America, and said Dexter assignor to United States Sugar Corp., Clewiston, Fla.

CANNING

Mold in Tomato Products

ALTHOUGH it may be checked by the use of fungicides, some tomatoes in every field will contain mold, particularly in humid weather. Spores of various fungi may survive several seasons in the soil and will attack tomatoes under favorable conditions. Spores of anthracnose can and will penetrate the skin of sound tomatoes, and mold may grow on the fruit after it is picked.

Sorting and trimming in the factory are two indispensable operations. They should not be combined in the hands of the same operators, but carried out separately by specially trained groups. Thorough washing of tomatoes is essential, but it can never take the place of sorting and trimming to remove mold. The sorting table should be constructed for maximum convenience. A single belt should not be wider than 20 in., and should not travel faster than 25 ft. per min. Tomatoes passing inspectors should not be more than one layer deep, and provision should be made for mechanically turning the tomatoes during their travel. Divided sorting belts for separating sound and moldy tomatoes have apparent advantages, but careful observation of their use indicates that operators are not as careful with them as with single belts. Sorters and trimmers must be specially trained in the recognition of the various defects that are to be removed. Lighting of inspection belts should be not less than 25 foot candles. Extreme cleanliness must be observed throughout the factory equipment.

Distribution of mold filaments in the final product is determined by the official Howard mold count method. In the insoluble constituents of the cyclone juice we have a physical mixture of tomato tissues and mold filaments. The analyst takes a drop of sample and examines it for the presence of mold filaments which are distributed among the tomato tissues in the sample just as they are throughout all the tomato tissues in the batch. But because the sample is a mixture, variations in count are inevitable. Fortunately the most probable results are those close to the average, and the variations therefrom tend to compensate each other.

Digest from "Mold Count on Tomato Products. Part II. The Occurrence and Distribution of Mold Filaments in Tomato Products," by H. R. Smith, *The Canning Trade*, vol. 70, 7-8, 20-21, July 5, 1948.

PACKAGING

Citrus Fruit Wrapper

PREVENTION of molding during shipping, and preservation of quality of citrus fruits with respect to taste, shrinkage and appearance are the claims made for a recently patented wrapper. It is made of tissue paper impregnated with a mixture of wax, mineral oil and pine oil, or alpha terpineol. The impregnating material is non-toxic, and is selective and specific to the types of mold infesting citrus fruits, such as *Penicillium digitatum*

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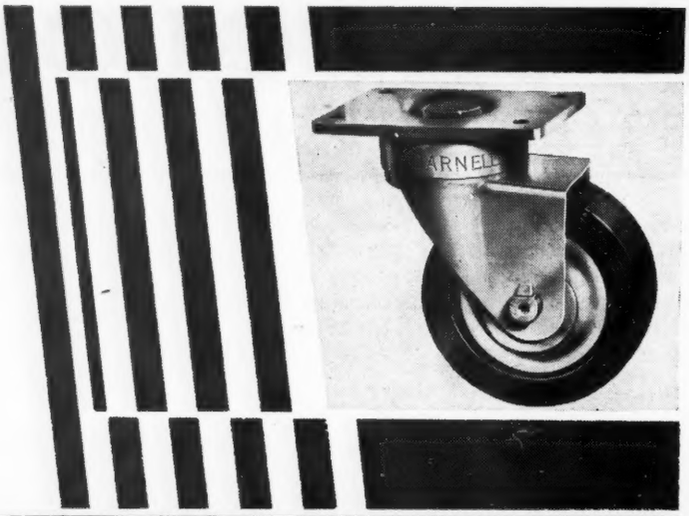

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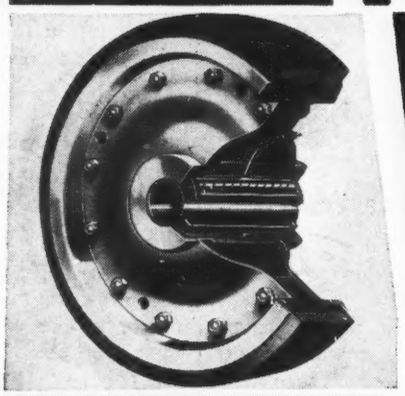


and P. italicum. The preferred mixture of wax and oil is 25 percent paraffin wax and 75 percent white mineral oil. To this is added from one to 3 percent pine oil. Paper is impregnated with the mixture to the extent of 13-15 percent of the bone dry weight of the paper. Experimental work is reported substantiating the claims for the wrapper.

Digest from U. S. Patent 2,443,795, issued June 22, 1948, on an application dated June 19, 1945, to J. R. MacRill, Ontario, and R. A. Baum, Claremont, Calif., and assigned to Fernstrom Paper Mills, Inc., Pomona, Calif.

ENGINEERING

Coffee Roaster

REDUCTION of coffee bean roasting time, from the customary 20-30 min. to not more than 3 min., is the object of recently patented equipment. According to the invention, a stream of coffee beans flows through an inclined, rotating metal drum, fitted with internal baffles to agitate the coffee beans and heated by a gas flame on its outer surface. The beans are roasted not only by contact with a hot metal surface, but also by radiant heat provided by a burner near the open discharge end of the drum. In order to cool the roasted beans rapidly they are passed through a second rotating, baffled drum, through which fresh air flows counter-current to the beans. The drums are contained in a housing which has a horizontal insulating partition between them. Satisfactory roasting is said to occur at a maximum temperature of 325-550 deg. F. for a period of 90 sec. to 2½ min. The cooling period lasts from 90-150 sec.

Digest from U. S. Patent 2,443,620, issued June 22, 1948, on an application dated June 24, 1944, to J. W. Hubbard, New York, and assigned to Alaska Pacific Salmon Co., Seattle, Wash.

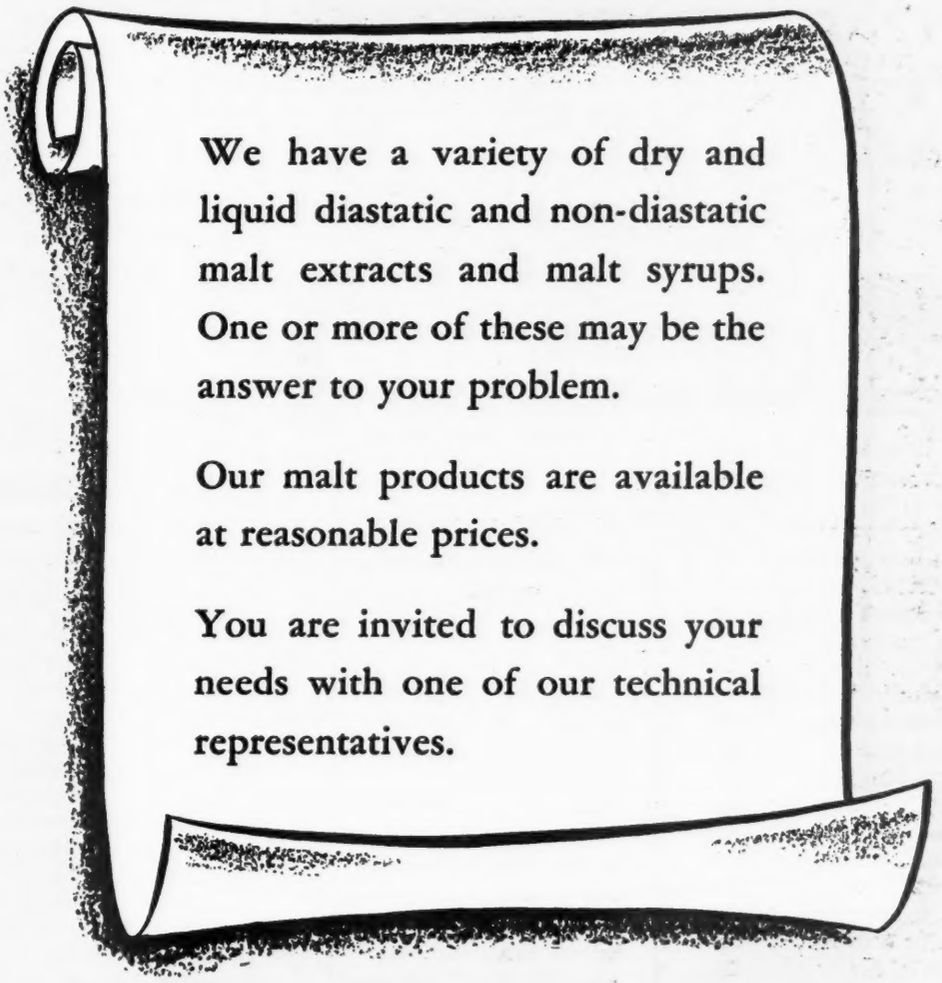
MEATS

Meat Flavors

MOST MEAT dishes are seasoned and altered by the cooking, so that little is known about the flavor of meat itself. Muscle fibers have been found to have no odor or taste when raw. Boiling develops the characteristic meaty taste. The flavor is actually an odor, as almost no taste of sweetness exists in it.

When a piece of lean beef (chuck) is heated to 212 deg. F. for 20 min. the weak blood or serum odor of the raw meat is changed to an alkaline odor characteristic of amines, but the sweet salty taste of the serum persists. Beef boiled in citric acid solution (pH 3.5)

Do you have a malt-flavoring problem?



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Our malt products are available at reasonable prices.

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Users of the Simpson Intensive Mixer are learning not to be surprised at any of the mixing jobs this versatile unit tackles nowadays . . . for it has put its special "mulling action" to work — wherever thorough blending is needed for a quality product.

Typical of the many mixing jobs successfully handled by Simpson Intensive Mixers is the preparation of dry mixes for the food industry—including cake, doughnut and biscuit mixes. The dry ingredients which go into these products are combined into a thorough, completely uniform blend, forming a mixture which is fluffy and easily wetted. Intensive mixing by mulling eliminates any "balling" of the materials, and quickly develops a product which is uniform in quality, and free flowing for easy packaging.

THE MULLING PRINCIPLE OF CONTROLLED MIXING

The unique "mulling action" of Simpson Intensive Mixers is comparable to the rubbing, kneading and smearing action of a mortar and pestle. This kind of mixing action eliminates any "balling" of materials and quickly effects a thorough dispersion of the elements in the mix. The result is a finished product of uniform quality. Because of the positive control obtained throughout this mixing process, it is known as "Controlled Mixing."

• For the preparation of products for the food industry, Simpson Intensive Mixers are available in 10 sizes, from 1/5 to 50 cu. ft. capacity. There are models for mulling every type of dry, semi-dry or plastic materials. Available with oil, steam or water jackets for vacuum mixing, and in stainless steel to meet sanitary requirements.

Let a National Engineer show you how a Simpson Intensive Mixer can save you time and money.

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developed an acetic-like sourness similar to corned beef. In sodium bicarbonate solution (pH 8.87) an amine and sulphury odor suggestive of clams or eggs developed.

The cooked meat flavor of boiled beef comes from the meat fibers; bones and marrow contribute very little flavor but do give body to meat preparations. The flavor increases up to 3 hr. boiling, then decreases. By distilling off and condensing the vapors it was shown that amines, hydrogen sulphide, and volatile acids all contributed to the flavor of the cooked beef.

Pork has the same meaty character as beef but more sweetness, volatile acid and sulphury ingredients, with some added base materials. Lamb is more alkaline than beef or pork, with a marked hexylamine character and a strong caprylic or pelargonic acid element. Long cooking drives off the acid odor. Lamb is lacking in the sulphury, egg-like odors. Chicken flavor is more complex than the red meats, and varies with the part of the bird from which the meat is taken. An egg-like odor and taste predominates in chicken meat.

Digest from "Flavor of Meat" by E. C. Crocker, *Food Research*, vol. 13, 179-83, May-June, 1948.

DAIRY

Flavor in Cheddar Cheese

STREPTOCOCCUS FAECALIS, as a starter in making pasteurized-milk American Cheddar cheese with more and better quality Cheddar flavor, has been studied and a strain was isolated which rapidly fermented lactose. Used as a starter, it produced acid in milk a little slower than a commercial lactic starter, but rapidly enough for cheese making. It developed more Cheddar flavor of better quality, and the body of the cheese was more mellow and waxy than cheese made with lactic starter. The best flavor of highest intensity was obtained by using both commercial starter and *S. faecalis* starter in the same pasteurized milk. *S. faecalis* starter hastened ripening, producing cheese of medium flavor intensity in 4.5 months at 50 deg. F. and in 2.5 months at 60 deg. F. when used with the usual lactic starter. The latter alone produced comparable cheese in 7 months and 4.5 months at the respective temperatures.

The foregoing results naturally directed attention to the growth characteristics of *S. faecalis* in cheese, because it is well known that the bacteria normally found in commercial lactic cheese starters do not long survive in cheese. Three lots of pasteurized milk were made into Cheddar

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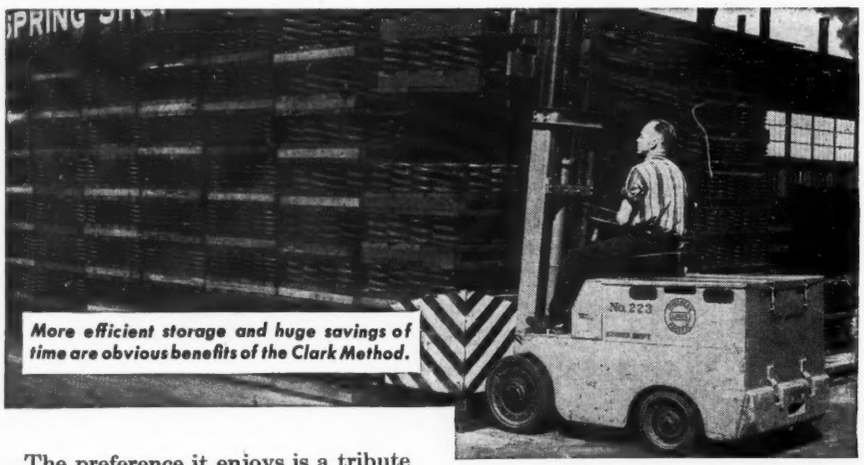
De Laval "Nozzle-Matic" machines separate essential oil from peel water and simultaneously remove and discharge the particles of fine interlining skin of the fruit. Any dirt on the peel is discharged simultaneously.

Other De Laval Separators are used for polishing the oil. Every bit of moisture is removed, leaving a clean, dry, bright oil.

MATERIAL HANDLING News

Reelected!-- by a ROUSING MAJORITY: the CLARK ELEC-CARLOADER!

Campaigning squarely on its record for versatile usefulness and exceptionally low cost, the Clark Elec-Carloader has been enthusiastically endorsed by World Industry as the outstanding materials handling machine of its kind.



More efficient storage and huge savings of time are obvious benefits of the Clark Method.

The preference it enjoys is a tribute to the Elec-Carloader's usefulness in Industry's program of increasing productive capacity within existing facilities; of accelerating output by speeding the flow of materials through processing, warehousing and transit; and of realizing vast potential savings.

The Elec-Carloader, with its 4000-lb. capacity, is a particularly effective combination of the famous Clark Carloader —outnumbering any other model of fork lift truck manufactured! — and electric battery power, as developed by Clark. Bred into it are Clark's mass production of component parts and of complete machines; Clark's maximum interchangeability of parts; and Clark's unparalleled automotive and materials handling experience.

To get the facts about the Elec-Carloader is to understand the beneficent revolution that is taking place in Industry's handling of materials. They are facts worth knowing, and are readily obtainable from a man worth knowing: a Clark field representative. It's a boon to any business to CONSULT CLARK.

Speed is the money-saving Clark keynote—in storing materials, in getting them out again.

CLARK ELECTRIC AND GAS POWERED FORK TRUCKS AND INDUSTRIAL TOWING TRACTORS

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AUTHORIZED CLARK INDUSTRIAL TRUCK PARTS AND SERVICE STATIONS IN STRATEGIC LOCATIONS

cheese with, respectively, 2 percent commercial lactic starter, one percent commercial lactic plus one percent *S. faecalis* starter, and 2 percent *S. faecalis* starter. The latter was able to grow and survive in Cheddar cheese in large numbers for considerable periods of time at both 50 and 60 deg. F. Its best growth occurred in the milk and curd up to salting, and it grew and survived in large numbers after 180 days of ripening.

Digest from "The Development of Flavor in American Cheddar Cheese Made from Pasteurized Milk with *Streptococcus faecalis* Starter," and "The Growth and Survival of *Streptococcus faecalis* in Pasteurized Milk American Cheddar Cheese," by A. C. Dahlberg and F. V. Kosikowski, *Journal of Dairy Science*, vol. 31, 275–84, 285–92, April, 1948.

VITAMINS

Sweet Potato Carotene

CAROTENE content of sweet potatoes increases during curing and storage according to the results of an investigation to determine whether there is a real, and not apparent, increase of that constituent. Loss in weight during curing and storage was taken into account. Carotene, total pigments, moisture, and weight of five varieties of sweet potatoes were determined at harvest, after curing, and at intervals during storage.

All varieties showed an absolute increase in carotene content during curing and storage, but it was apparent that variety is the dominant factor in judging the provitamin A value of sweet potatoes. This suggests the necessity of care in selecting propagating stock to maintain strains high in carotene. In the five varieties tested, depth of color of the flesh proved to be a reliable index of the provitamin A value. As the total pigments increased, carotene increased much more rapidly than the other pigments.

Digest from "Effect of Variety and Storage on Carotene and Total Carotenoid Pigments in Sweet Potatoes," by B. D. Ezell and M. S. Wilcox, *Food Research*, vol. 13, 203-12, May-June, 1948.

FREEZING

Preservation of Apples

QUICK-FREEZING of raw, sliced apples to retain substantially all their natural color, bouquet, and flavor constituents when defrosted and used in food products, is the basis of a patented process. Fresh ripe apples are peeled and immersed in a brine solution, and later cored and sliced into a similar solution. A suitable quantity of slices in brine is subjected first to a vacuum and then to pressure to remove air and im-

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pregnate the surface with brine. Thus prepared, the slices are drained, placed loosely on trays and sprayed with a refrigerant solution of sugar containing soluble extracts of apples, applied in such volume as to quick-freeze the surface of the slices, and ultimately freeze them throughout. The frozen pieces are then drained, packed in containers and placed in cold storage at a temperature below the freezing temperature of the apples but above the freezing point of the adhering solution. Other flavoring substances may be added to the frozen pieces during storage or at the time of removal for shipment to the consumer. In this way sufficient sugar and flavoring may be combined with the apple substance to satisfy the requirements of apple pies or other apple food products.

Digest from U. S. Patent 2,443,866, issued June 22, 1948, on an application dated Sept. 3, 1943, to H. A. Noyes, Watertown, Mass.

DEHYDRATION

Mashed Potato Powder

DEHYDRATED mashed potatoes that are easily reconstituted into a nonsticky, palatable and natural potato mash is the object of a recently patented process. The process comprises cooking, mashing and freezing the potatoes, then allowing them to thaw. By mechanical means—preferably centrifuging—the moisture content of the thawed material is reduced to less than 40 percent. Heat is applied to complete the drying of the powder. When the moisture content after centrifuging exceeds 40 percent it has been found advisable to add sufficient powder from a previously prepared batch to reduce the moisture content to about 40 percent before drying.

Digest from U. S. Patent 2,439,119, issued April 6, 1948, on an application dated Nov. 15, 1945, to A. K. Willetts and Theodore Rendle, Histon, England, and assigned by mesne to M.P.P. (Products) Ltd., Norwich, England.

Spray-Drying Yeast

ACTIVITY of dry yeast is seriously affected by the high temperature employed in rotary film drying, and by the protracted period of treatment in cupboard, hot air, vacuum, and infrared radiation drying processes. Accordingly experimental work was undertaken to find a process that would yield a high percentage of active cells in dry yeast. This was found in spray-drying apparatus comprising a gas-fired air heater, drying chamber, feed tank for yeast liquor, atomizing unit, cyclone separator and dust filter. Brewer's yeast liquor containing 13 percent solids was pumped to an inverted

HELP WANTED?

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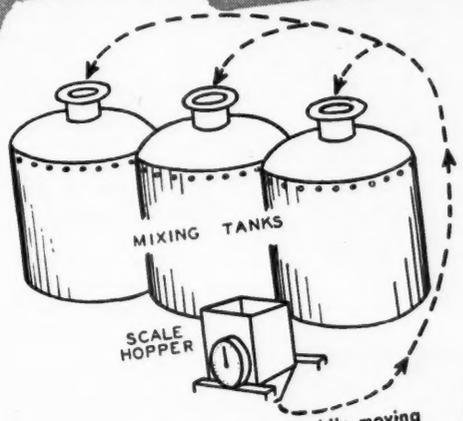
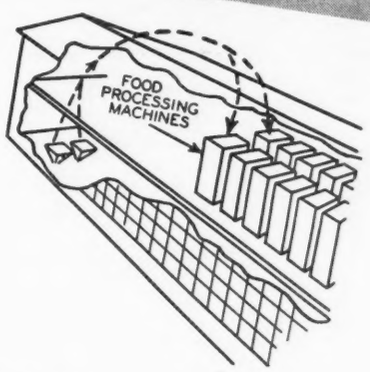
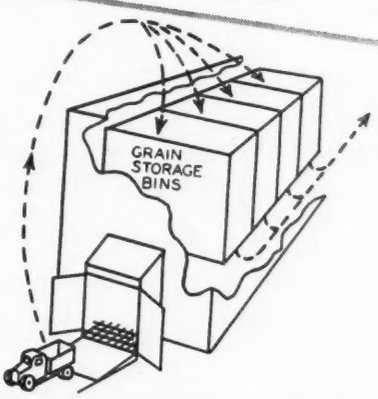


Keeping several grains clean while moving them from scales to mixing tanks.



Elevating food mix to processing machines without segregation or contamination.

—From the files, here are a few of the many jobs successfully engineered and equipped by S-A



Moving grain from truck to storage and then reclaiming it, cleanly and without loss.

When you sit down with the S-A engineer to study out a bulk materials handling problem, you and he are able to select the *best* system to do the job at lowest cost per ton. He doesn't have to solve every problem with just a few types of equipment. For S-A has the *complete line* of belt conveyors, bucket elevators, enclosed conveyors, skip hoists and other equipment designed for moving materials in bulk.

Add to this the know-how gained in 47 years—and you'll see why S-A is in a uniquely selective position to aid you. The first step in planning the most efficient and workable low-cost material handling system is this: Write us for the willing cooperation of an S-A engineer in matching specific units to your specific requirements.

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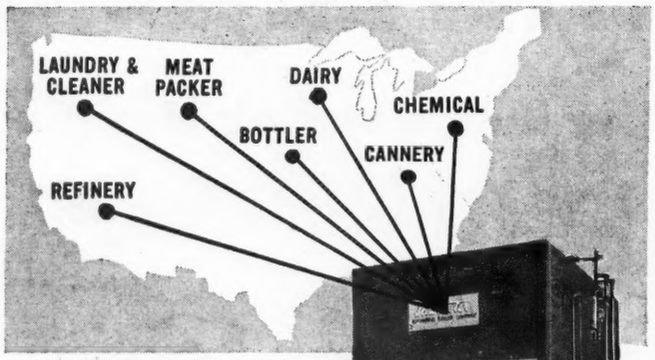

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atomizing bowl revolving at 10,000 rpm. at the top of the drying chamber, into which the products of combustion of the air heater were discharged at 293 deg. F. Yeast powder was discharged from the bottom of the chamber at a temperature of 86 deg. F., having been in contact with hot gases for 2-3 sec. without reaching a temperature of more than 122 deg. F. at any time. The powder was mostly finer than 200-mesh, and the percentage activity was 18.9. The material is stable against mold, incidental bacterial activity and depreciation in activity after long storage.

Digest from "Dry Active Yeast," by Alan Stubbs, *Food*, vol. 17, 213-17, July, 1948.

MISCELLANEOUS

Radioactive Materials Stimulate Plant Growth

RADIOACTIVE materials, in conjunction with commercial and organic fertilizers, increase the yield of market vegetables. Maximum increase with commercial fertilizer was effected with medium doses. With organic fertilizer maximum increases appeared with small dosages.

Experiments were conducted with carrots, tomatoes, potatoes, cabbages and green beans. Four plots of land were prepared: (1) Using no fertilizer; (2) commercial fertilizer only; (3) manure, and (4) manure and commercial fertilizer. Each plot was then divided into 4 sub-plots, 3 of which were treated with different dosages of radioactive materials. The 4th plot was untreated. Exhaustive records were kept of the date of the first harvesting, weight of the harvest and the period from first harvesting to end of crop. The experiments showed that radioactive material has a very marked influence on yield.

It was concluded that, since radioactive materials increase the yield most significantly when used with commercial fertilizers, they activate the result of some of the chemicals contained in the fertilizer.

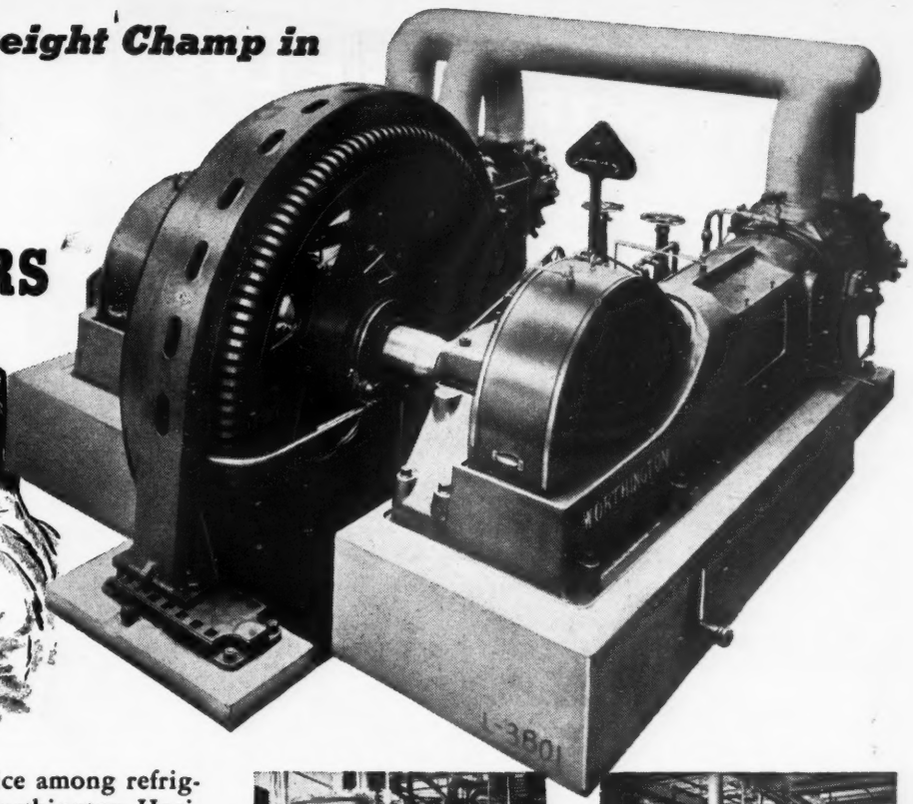
Digest from "Effect of Radioactive Materials on Stimulating Plant Growth," by Carl B. French, *Canadian Chemistry and Process Industries*, 225-26, March, 1948.

Oil-Free Citrus Juice

EXTRACTION of citrus juice that is substantially peel oil free is the object of a recently patented apparatus. The operation is continuous and the mechanism will handle various sizes of cut fruit, although lengthwise quarters are preferred. The apparatus consists of a rotating drum of relatively large diam-

Here's the Heavyweight Champ in

HORIZONTAL DUPLEX COMPRESSORS



For heavy-duty work, first choice among refrigeration compressors is the Worthington Horizontal Double-Acting Compressor.

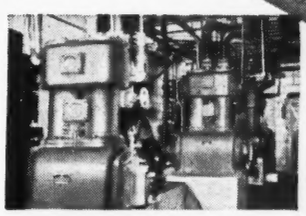
There's *solid punch* in the machinery-steel piston rods operating in special alloyed semi-steel cylinders with full-size suction and discharge openings, large refrigerant-gas passages and liberal valve area.

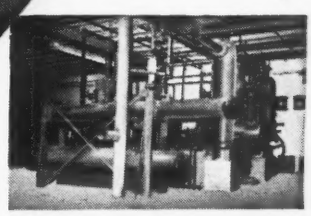
There's *sure-footedness* in the cast-iron frame, with base extending full length to minimize cylinder overhang and give maximum bearing on foundation.

There's *staying-power* in the open-hearth steel-forged crankshaft . . . counterbalanced crank pressed onto shaft and securely keyed . . . heat treated and hardened crank pins . . . marine-type connecting rods.

And there's *trouble-protection* in the exceptionally deep stuffing boxes with metallic full-floating packing . . . babbitt-lined steel bearings centrifugally cast in steel . . . full pressure-type lubrication on large sizes, flood type on smaller.

For further proof that *there's more worth in Worthington,* see your nearby Worthington distributor, or write for Bulletin C-1100-B20 to Worthington Pump and Machinery Corporation, Harrison, N. J. *Specialists in air conditioning and refrigeration machinery for more than 50 years.*





WORTHINGTON IN WORLD'S LARGEST ORANGE JUICE PROCESSING AND CONCENTRATING PLANT

At the Dunedin, Fla. plant of Juice Industries—reputedly the largest of its type in the world—Worthington has installed:

LEFT—Three vertical ammonia compressors to cool two large storage rooms—one where frozen concentrated orange juice is kept at zero degrees, the other for standard concentrated juice at 35F. Both rooms are 80 by 80 by 20 ft high; the former has 12 in. of insulation, the latter 6 in.

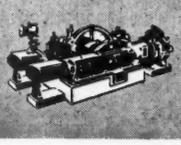
RIGHT—Horizontal ammonia compressor for quick-freezing the concentrated juice at minus 20F. Quick-freezing of the juice (while packed in cans) seals in the vitamin content which would dissipate if stored for long at moderate temperatures.

WORTHINGTON

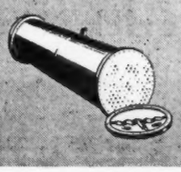
AB-37

FIVE MORE REASONS WHY WORTHINGTON LEADS IN INDUSTRIAL REFRIGERATION

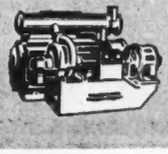
Horizontal compressors for all types of refrigerants



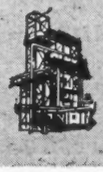
Shell and tube refrigerating equipment



Centrifugal compressors



Absorption refrigerating machines



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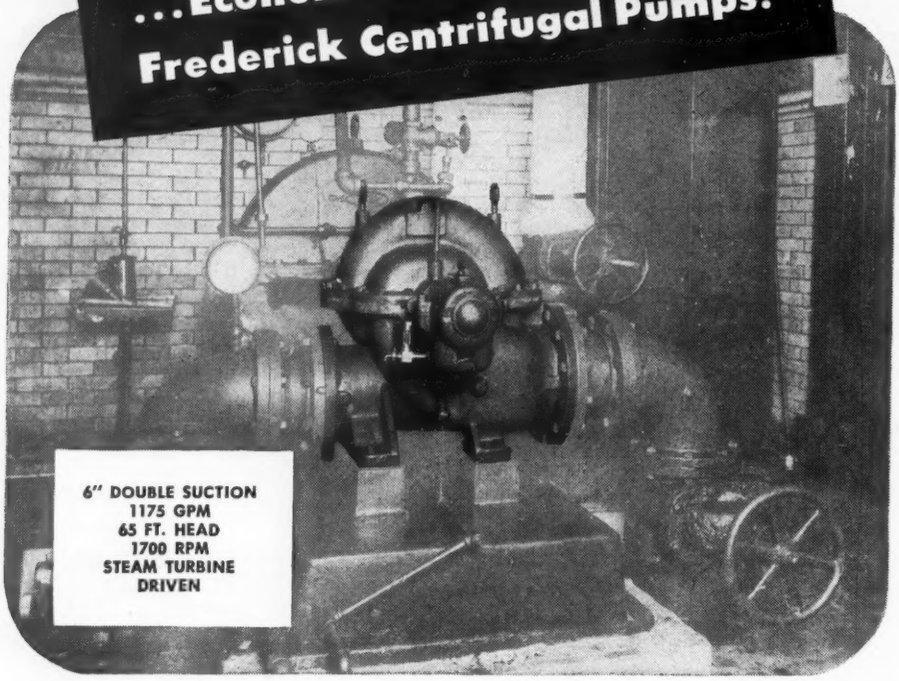

Twenty-nine years ago, Frederick Iron & Steel manufactured its first centrifugal pump . . . a 6" Double Suction Volute type. Delivered in July, 1919, this pump is still in operation today at the Dominion Coal Co. in Sydney, Nova Scotia. Minor repair parts over the 29-year period have been furnished promptly by Frederick. Today, Frederick Iron & Steel is manufacturing a complete line of single and double suction, single and multi-stage centrifugal pumps with the same long-lasting quality built into its first unit. When you buy Frederick pumps you're assured of continuous, economical operation from extra long life.

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eter and a stationary plate member extending along the under half of the drum surface. The stationary plate is slightly eccentric to the periphery of the drum and forms with it a gradually constricted passageway along which fruit segments move for the expression of juice. The plate member is trough-shaped at the input end of the passageway and gradually flattens toward the output end where the space between drum and plate is substantially that of the thickness of the peel. Fruit segments introduced into the passageway are engaged by the rotating surface of the drum and gradually flattened as they progress toward the outlet. Juice is expressed, and toward the end of the passageway seeds are expelled through slots in the plate. Peels are discharged over the end of the plate. With a drum of substantially large diameter, against which the peel is gradually flattened without being greatly flexed, there will be minimum rupture of oil sacs to contaminate the juice.

Digest from U. S. Patent 2,444,203, issued June 29, 1948, on an application dated Oct. 20, 1943, to R. B. McKinnis, Winter Haven, Fla.

Starch Solubilities

STARCHES subjected to the grinding action of a ball mill disintegrate into materials of lower molecular weight. The low molecular fragments are characterized by their solubility in cold water. Since disintegration of high molecular weight starch into smaller fragments releases in increasing number of aldehyde groups, the increased reducing power of the starch can be calculated in terms of molecular weight by a simple formula.

Potato starch has a mean molecular weight of 190,000 and wheat starch 51,000 by these methods. After about 100 hr. of grinding the molecular weight of potato starch is reduced to 59,000. It is completely soluble in cold water. Wheat starch is more resistant and was only 77 percent soluble after 470 hr. After 240 hr. potato starch had a calculated molecular weight of about 20,000. Wheat starch has been ground for as long as 7,000 hr. at which time it had a molecular weight of 5,600 or about 10 percent of its initial value.

There are differences in appearance and solubility between the cold water soluble and hot water soluble fractions of wheat starch, that do not occur in the potato starch fractions. Differences in molecular weight account for the differences in solubility of potato starch but not for wheat starch.

Digest from "The Fractionation of Potato Starch. Part II. The Reducing Powers, Mean Molecular Weights and Solubilities of the Fractions", by L. H. Pampitt, C. H. F. Fuller and N. Goldenberg, Journal of the Society of Chemical Industry, vol. 67, 38-40, January, 1948.

BOOKS

Basic Processing

COMMERCIAL FRUIT AND VEGETABLE PRODUCTS, 3RD EDITION. By W. V. Cruess. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y., 1948. 906 pages; 6¾ x 9¼ in.; cloth. Price $8.50.

Here is a long looked for edition of this notable work—the third in 24 years and the first since 1938. Developments in food and vegetable processing during the past ten years have been on a scale with the world events of the period. The stimulus of war brought changes in canning, freezing and dehydrating that would normally have been spaced over a generation or more.

Most of these changes and developments are recorded here. They are represented, not only by advances in the scientific knowledge of food processing, but by great improvements in basic processes and by new and improved equipment.

As a result there has had to be considerable revision of many of the chapters. And one new chapter—Plant Sanitation—has been added.

The book is a valuable addition to the library of the food manufacturer. It will also be of value to those responsible for food plant operations, whether he be factory manager, foreman or chemist.

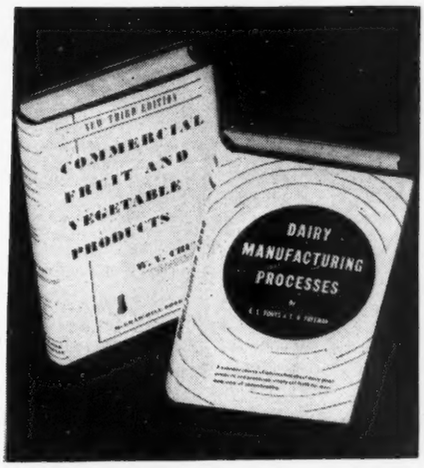
Research Directory

SURVEY OF FOOD AND NUTRITION RESEARCH IN THE UNITED STATES 1947. Published by National Research Council, 2101 Constitution Ave., Washington, D. C., 1948. 306 pages; 6¾ x 9¾ in.; paper. Price, $1.

With the rapid expansion of research on food and nutrition problems, the need for a comprehensive record became more and more apparent. This need was recognized even before the war. During the war years the need became critical.

In this first attempt to compile such a record the Research Council was assisted financially by the Committee on Food Research of the Quartermaster Food and Container Institute. It marks an excellent start. The book lists names and addresses of individuals working, or qualified to work, on food and nutrition research. It also lists investigative work under way.

The book can be as useful to food industrialists as it will undoubtedly be to public institutions. It provides a reference for a widely diversified field that may save many a dollar for company research laboratories.



Milk Products

DAIRY MANUFACTURING PROCESSES. By E. L. Fouts and T. R. Freeman. Published by John Wiley & Sons., Inc., 440 Fourth Ave., New York 16, N. Y., 1948. 237 pages; 6 x 9¼ in.; cloth. Price, $3.50.

An excellent job of measuring up to an ambitious title is performed by the authors of this book. It constitutes a practical handbook on the handling, processing and testing of butter, soft cheeses, ice cream, milk and other dairy products.

Having prepared the book primarily for dairy plant workers, very little space has been given to theory. Information essential to the understanding of each product or process is provided as are the reasons for the process. In most cases a procedure is also recommended.

The material is alphabetically arranged so that information on a specific point can be easily found.

Small Motors

FRACTIONAL HORSEPOWER MOTORS. 2nd Edition. By Cyril G. Veinott. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York City 18, 1948. 554 pages; 6¾x9¾ in.; cloth. Price $5.

Aim of this book is to tell what types and kinds of fractional horsepower electric motors are available, and explain how they run, what they will do, and how to repair them. It should be useful to the food plant engineer who has to deal with the problems of selecting, maintaining and applying such motors.

This second edition revises and supplements the first published in 1939. Some chapters have been completely rewritten, others rearranged for greater reader convenience. The author, manager of induction motor section, Small Motor Division, Westinghouse Electric Corp., is well qualified in this field.

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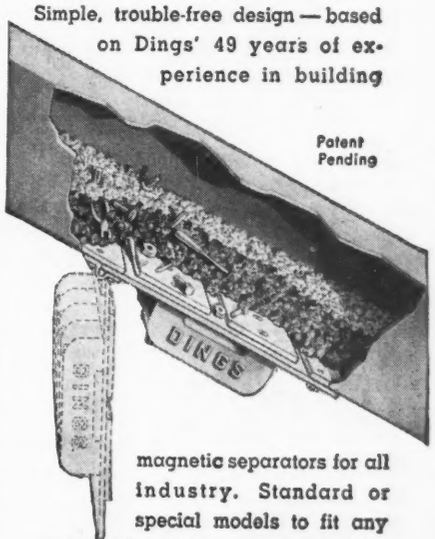

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GOVERNMENT PUBLICATIONS

The following recently issued documents are available, at the prices indicated, from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. When no price is indicated the pamphlet is free and should be ordered from the Bureau responsible for its issue.

CONTROLLING INSECTS IN FLOUR MILLS. By R. T. Cotton, et al. U. S. Department of Agriculture, Circular No. 720. Revised. Price 20 cents. An elaborate report on types of insects and specific methods recommended for factory control, useful in many ways beyond flour mills.

PREPARATION OF CABBAGE FOR MARKET. By Raymond L. Spangler. U. S. Department of Agriculture, Farmers' Bulletin 1423. Revised. Price 10 cents. Market types, containers, methods of shipping and handling cabbage as a truck crop and for sauerkraut manufacture are given in this revision.

REPORT ON THE AGRICULTURAL EXPERIMENT STATIONS, 1947. By R. W. Trullinger, et al. Price 25c. A resume of Station activities in experimental work, especially that largely financed by U. S. funds.

MARKETING EGGS. By Joseph William Kinghorne. U. S. Department of Agriculture, Farmers' Bulletin 1378. Revised. Price 15 cents. Methods of marketing eggs, including grading, packing, shipping, and storing are outlined in this revision.

FARMERS' PRODUCE MARKETS IN THE UNITED STATES. By John L. Wann et al. U. S. Department of Agriculture. January 1948. Processed. Directory with descriptions of typical installations and methods for their operation; useful for food-industry buyers.

NATIONWIDE INVENTORY OF SANITATION NEEDS. Supplement No. 204 to the Public Health Reports. Price 15 cents. A comprehensive statistical summary of the magnitude of pollution-control problems in various parts of the country.

PRODUCTION OF RUTIN FROM BUCKWHEAT LEAF MEAL. By Roderick K. Eskew. Bureau of Agricultural and Industrial Chemistry, AIC-114. Revised. Available on request to Eastern Regional Research Laboratory, Philadelphia 18, Pa. Processed. Recommended process equipment and methods of factory control for this drug byproduct of feed processing.

GRAIN GRADING PRIMER. By Willis B. Combs and Fred G. Smith. U. S. Department of Agriculture, Miscellaneous Publication 325. Revised. Price 20 cents. Includes data for wheat, feed grains, soybeans, and others. Does not give full technical details for inspectors, but comprehensive descriptive information.

PATENTS

Meat Balls Mechanically Formed by Extrusion of Ground Meat through Cylindrical Orifice under Pressure, Cutting with Rotary Knife and Shaping in Rotating Drum—J. M. Archer and J. A. Pepper, Vineland, N. J. No. 2,442,633. June 1, 1948.

Starch Stabilizer/ of Abnormally Low Settling Rate made to Consist of Substantial Proportions to Pre-gelatinized and Non-gelatinized Starch—R. L. Lloyd, Laurelton, N. Y. to American Maize-Products Co. No. 2,442,658. June 1, 1948.

Meat Cure Mixture made to Contain Gelatin Liquor and Curing Salts; Gelatin Liquor Consists of 10 to 25 percent of Total Ingredients Based on Dry Weight—C. A. Rinehart, to Industrial Patents Corp. Chicago, Ill. No. 2,442,663. June 1. 1948.

Vitamin B_6 Obtained in Pure State by Treating Impure Vitamin B_6 with Boric Acid to Produce Vitamin B_6-Borate Complex as Intermediate—M. L. Brown, Clark Township, Union County, N. J. to Merck & Co. Inc., Rahway, N. J. No. 2,442,677. June 1, 1948.

Shell Eggs Mechanically Assorted According to Weight during Passage over Scale by Rotation of Worm Feed—J. A. Hill, Canoga Park, Calif. No. 2,442,689. June 1, 1948.

Wheat Starch Slurry Containing 15 to 24 percent Starch Solids and 2 to 4 percent Protein Solids Saccharified, Concentrated by Multiple Stage Vacuum Evaporation, Cooled to Below 55 deg. C. for Addition of Proteolytic Enzyme to Digest Protein and Centrifuge for Separation of Crystallized Dextrose and Protein-Containing Liquor—J. F. Walsh, Holland, Mich., D. M. Levitt, Great Neck, N. Y. and A. H. Goodman, Holland, Mich. to Doughnut Corp. of America, New York. No. 2,442,789. June 8, 1948.

Colored Sugar Syrups of 50 to 70 deg. Brix Purified by Recycling Extraction with Water Soluble Organic Cyclic Ether Containing Two Oxygen Atoms per Molecule and Having Boiling Point Below 130 deg. C.—P. J. Gaylor, Union, N. J. No. 2,442,804. June 8, 1948.

Malt Liquor Beverage Containing 5 to 7.5 percent Alcohol by Volume and Having Sugar Content by Balling Test Between 0.5 and 1.0 percent by Two-Step Enzymatic Process to Aid Fermentation and Break Down Difficultly Fermentable Sugars—A. C. Gluek, Minneapolis, Minn. No. 2,442,806. June 8, 1948.

Fats and Fatty Oils Hydrolyzed by Heating with Water and Sulphonic Acids of Polyalkylated Benzene Fraction Boiling within Range of 400 to 550 deg. F.—Wm. K. Griesinger, Drexel Hill, Pa. to Atlantic Refining Co., Philadelphia, Pa. No. 2,442,925. June 8, 1948.

Edible Starch Sponge made by Heating from 4 to 20 percent Commercial Starch Suspension in Water to 70 to 100 deg. C. to make Paste, Freezing at 0 to -20 deg. C., Thawing with Removal of Liquid and Drying to About 2 to 15 percent Moisture Content at Below Dextrinization Temperature—M. M. MacMasters and G. E. Hilbert, Peoria, Ill. to United States of America. No. 2,442,928. June 8, 1948.

Stearic Acid Freed from Impurities Consisting of Other Fatty Acids—D. E. Adelson, Berkeley, Calif. to Shell Development Co., San Francisco. No. 2,443,068. June 8, 1948.

Baked Cereal Food made to Contain Appreciable, but Small Quantity of Bentonite as Preservative against Mold Growth—E. G. Holden, Jr., Lemoore, Calif. to American Colloid Co., Chicago. No. 2,443,138. June 8, 1948.

Egg Meats Mechanically Separated From Shell by Grinding Circumference of Each Egg to Remove Portion of Shell during Rotation without Rupturing Egg Membrane Preliminary to Mechanical Slitting of Membrane—G. F. Hodson, Altus, Okla. to Wilson & Co. Inc. No. 2,443,188. June 15, 1948.

Cereal Flour Treated with 0.02 to 5.0 Percent of Formaldehyde to Give Readily Water Dispersible Starch Product which Gelatinizes without Lumping or Forming Dough—J. V. Bauer, Elmwood Park, Ill. to Stein, Hall & Co. Inc. No. 2,443,290. June 15, 1948.

Starch Recovered from Starch Slush, Fibers, and Fruit Water by Action of Centrifugal Drum Equipped with Stirrer and Surface Scraper—C. G. Eckers, to Aktiebolaget Separator, Stockholm, Sweden. No. 2,443,310. June 15, 1948.

Dry Food Materials Mechanically Filled and Weighed into Container Using Scale-Controlled Mechanism to Operate Discharge Valves on Hoppers Equipped with Bulk and Dribble Discharge Gates—H. A. Gilbert and I. L. Tolf, Battle Creek, Mich., and J. J. Thayer, Elkhart, Ind., to General Foods Corp., New York. No. 2,443,350. June 15, 1948.

Vitamin A Material Converted to Phosphoric Acid Ester Composition—N. A. Milas, Belmont, Mass., to Research Corp., New York. No. 2,443,473. June 15, 1948.

Ice Cream and Like Packaged in Folding Cartons Designed to Have Overlapping Gussets and Self-Closing Top Flap—S. H. Berch, Beverly Hills, Cal. Nos. 2,443,530 and 2,443,531. June 15, 1948.

Ascorbic Acid Obtained from Water Solution of its Salts by Ion Exchange Treatment—H. H. Mottern and R. E. Buck, Philadelphia, Pa. No. 2,443,583. June 15, 1948.

Printed copies of patents are obtainable, at a cost of 25c each, directly from U. S. Patent Office, Washington, D. C.

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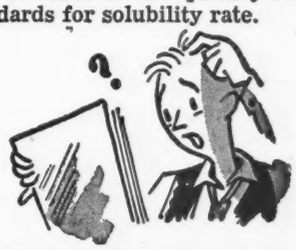
● Maybe you're like a lot of food technologists and salt buyers who have gone along thinking all salt is the same. Actually, of course, various brands and grades and grains of salt differ in many respects.

Take solubility: In salting cheese, slow solubility is highly important and desirable. Otherwise, salt is lost in the whey, producing flat, under-salted cheese. On the other hand, in salting butter, salt must dissolve with lightning speed. If the butterfat is on the soft side—lacking in body—at certain seasons, butter salt must dissolve so quickly that over-working is avoided. Otherwise, the butter may lose its desirable physical properties and become mottled or marbled—and may lose its moisture, become leaky. Yet, if the salt is not properly dissolved, the butter may be gritty.

To meet these problems, we have set up definite solubility standards for Diamond Crystal Salt. Our Butter Salt, for example, dissolves completely in water at 65° F. in less than 9.8 seconds—average rate, 9.2 seconds. That is why so many quality-minded food processors have learned to depend on Diamond Crystal products, manufactured under strict quality-control standards for solubility rate.



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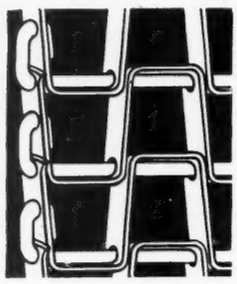

for example:

clean belts last a long time: Thorough cleaning action of Oakite Composition No. 20 speedily removes tomato, carrot, potato and residual deposits—without harming surfaces. For complete rust and stain removal use kind-to-metals Oakite Compound No. 84M. GRATIS Oakite "97" Digest gives full details.

for example:

clean kettles protect product purity: Ward off bacterial contamination; use Oakite Compound No. 63 to clean processing and handling equipment. O.C. 63 has gentle, yet thorough emulsifying action that completely removes soil. Rinses freely and readies surfaces for sure germicidal treatment. Oakite "97" Digest tells about it. Your copy FREE.

for example:

clean retort baskets mean clean cans: Spill-over residues thoroughly removed by soaking units in recommended solution of Oakite Composition No. 63. This high-speed detergent easily breaks up bacteria-harboring fruit and vegetable soils. Does not attack metal. FREE Oakite "97" Digest gives full details.

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Take a look around your plant. For every place you see to protect product purity with *time-saving* Oakite cleaning, you see a place where you can conserve equipment with *safe* Oakite cleaning. For facts about 97 day-in and day-out food plant cleaning jobs, send for the Oakite "97" Digest. Or ask the Oakite Technical Service Representative to show you Oakite cleaning in thorough, safe, economical cleaning action. No obligation, either way.

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Specialized Industrial Cleaning

Beer Through The Ages

(*Continued from page* 118)

houses whose business is solely that of producing malt.

Malt Adjuncts

The two main malt adjuncts are rice and corn. Inasmuch as the starch body of these two cereals is comparable, no great difference in brewing operations results from the use of either rice or corn.

Rice is grown extensively in California, Texas, Louisiana and Arkansas and, prior to the war, a great deal of this material reached the brewing industry. During the war very little brewer's rice was available. Corn is grown in the midwestern states, notably Iowa, Nebraska, Illinois and Kansas, and the most desirable for brewing is the white corn. Yellow corn is also used, and is entirely satisfactory as a malt adjunct. It is interesting to note that corn starch, which is a wet process starch material used in brewing, is produced entirely from yellow corn. Many sugars and sirups are also produced from corn. Some of these sugars enter the brewing field, particularly in connection with ale brewing.

Non-Extract Material

Hops, the other brewing material, is non-extract producing. It gives the beer its bitter principle and a certain amount of its aroma. The tannic acid in hops aids in the coagulation and precipitation of albuminoids during boiling operations in the brewhouse. Hops also aid in promoting biological stability of the finished beer.

Brewing Operation

The actual brewing operation is one of degradation of starch bodies, and their conversion into a liquid known as wort, which is fermented by brewers' yeast. The malt is crushed, not pulverized, by the use of specially constructed mills. This crushed malt is mixed with water at a temperature of approximately 100 deg. F., and allowed to rest about one hour. The malt adjunct, rice or corn, together with a small amount of crushed malt is mixed with water at the same temperature in another vessel, forming mash. This mash is slowly heated to boiling in order to gelatinize the starch and prepare it for conversion by the malt mash. After boiling for one hour it is mixed with the malt mash and the entire mash brought to a temperature of approximately 170 deg. F. Mashing is continued at this temperature until the proper degree of

starch conversion into maltose has been accomplished.

The fully converted mash is run into another vessel, equipped with a slotted or drilled bronze false bottom which rests about one inch above the real bottom. This false bottom, together with the malt husks, serves as a filtering medium.

By means of special devices, it is possible to control the flow of the liquid, or wort, which passes from this vessel to the brew kettle. At repeated intervals, hot water, at a temperature of approximately 170 deg. F., is sprayed over the surface of the mash to wash the extract from the grain. By the time the kettle is filled to a predetermined level, the liquid running from the mash contains such a low percentage of solids that further reclamation cannot be carried on economically. The spent grain, high in protein and containing much residual extract, is collected and utilized as a supplementary cattle feed.

The wort is vigorously boiled and hops are added at various intervals. After coagulation of the albuminoids and clarification of the wort, the brew is filtered to remove the spent hops and albuminoids. It is then ready for cooling. The total dissolved solids in this wort will vary, depending upon the type of product made, but will average approximately 12 percent.

Cooling of the wort is done by various devices, the one commonly used being that known as a Baudelot cooler. This cooler consists of a series of pipes arranged in vertical tiers. The wort flows over the outside of the pipes, while a cooling medium is circulated through the inside. Water is used as the cooling medium in about $\frac{3}{4}$ of the cooling area. The other $\frac{1}{4}$ is cooled with ammonia or brine. The wort is cooled from boiling to approximately 40 to 50 deg. F., and gathered in vessels located in a refrigerated room known as the fermenting room. The temperature of this room is maintained at 40 to 42 deg. F. Brewers' yeast is added to the cooled wort.

Pure Cultures

It is probably not generally known that the famous Louis Pasteur had a great deal to do with the development of pure yeast. This was brought about by his extensive work on the diseases of wine in his native country, France. The work which he so ably started was carried on by others, and the real developer of the pure yeast culture was a Dane, Emil Christian Hansen. It was he who proved that all yeasts used were a mixture of various types, and that when certain types got the upper hand, trouble was encountered. He established the principle of cell isolation, and by isolating single cells

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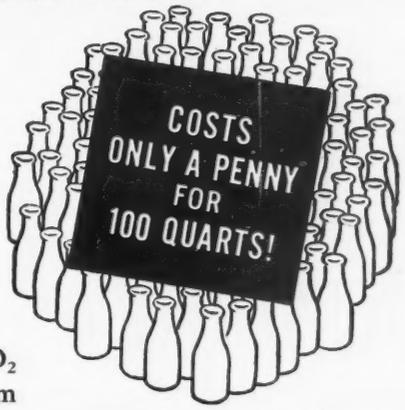

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The Council on Foods and Nutrition of the American Medical Association has declared Deltaxin in propylene glycol suitable for the fortification of Council accepted vitamin D milk.

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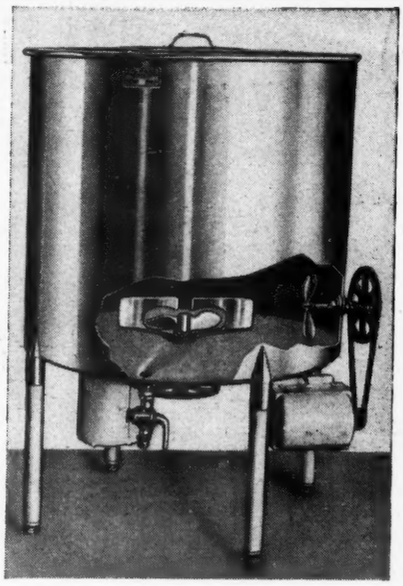

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brought about the delevopment of the pure yeast culture. Incidentally, he also designed and supervised the construction of the first pure yeast apparatus. Since the publication of his noteworthy work in 1881, breweries throughout the world have been in a position to operate with pure yeast cultures.

Fermentation

In from 16 to 20 hours after cooling the brew and adding the yeast, fermentation begins. The duration of the fermentation is anywhere from 8 to 10 days. Temperature is controlled within reasonable limits by the circulation of brine or ice water through suitable cooling coils, located in the fermenting tanks. The wort, as it ferments, accomplishes its first stage of becoming beer. The brewer is able, with reasonable supervision, to obtain suitable ratios of sugar to non-sugar in the wort, thus regulating attenuation.

After fermentation is completed, beer is transferred to a closed vessel in another room, where the temperature is maintained at close to the freezing point. Storage of beer at this point varies, depending upon the methods of operation used by the brewer.

Filtration

After storage, the beer is subjected to various methods of stabilization and clarification; followed by final filtration and impregnation with CO_2. The CO_2 used is that which was produced during the fermenting operation. By means of suitable equipment, this CO_2, produced under low pressure is compressed upwards to 250 psi. and stored in large, specially constructed steel pressure tanks. The CO_2 may also be liquefied and used as such. All operations in connection with the fermenting, storing and finishing of the beer are carried on in refrigerated rooms. After it leaves the fermenting room, beer is kept at temperatures slightly above 32 deg. F.

Filling Into Kegs or Bottles

The finished beer is now ready for filling into kegs for draught beer consumption, or to be transferred, through U. S. Treasury Department controlled meters, to receiving tanks from which it is filled into bottles or cans.

The bottling operation is briefly as follows: All bottles, new or old, pass through a so-called soaker-type washer where they are immersed in an alkaline solution at a temperature of about 170 deg. F. After this soaking, the bottles are thoroughly brushed and washed with fresh water on the inside and outside. They are carefully inspected, and pass on to the filling machine where they are filled.

From the filler, the bottles pass to the capping machine and continue to the next inspection device and through the pasteurizer. Here the beer is subjected to a temperature of 140 deg. F. for from 15 to 20 minutes. The bottles are sprayed with cold water to partially cool them before they leave the pasteurizer. Then, at a temperature of about 90 deg. F., they are conveyed to the labeling machines, and thence to the packaging machines where they are packed into cartons or cases. The packaged beer is removed to the warehouse, ready for delivery to the trade.

Cans are filled in a similar manner excepting that they are not subjected to soaking but are rinsed and drained before filling. In addition thereto, the cans require no labeling.

—End—

"Down-Hill" Cannery

(*Continued from page* 81)

refuse is later used for stock feed.

Below the scale hopper is a metal cylinder in which there are two pockets, each of which holds a volume of peas equal to 10 lb. weight. This cylinder is set into motion by a diaphram micro-switch, located near the top of the hopper. When filled with peas, the weight presses against the switch and actuates the motor driving the cylinder. The pockets alternately fill from this hopper then discharge into a flume and are carried to the cannery.

There are three scales connected to the three flotation cleaners located in this building. A recording counter, located on the cylinder, provides a record of the product weight passing through the scales. Growers are paid from these records.

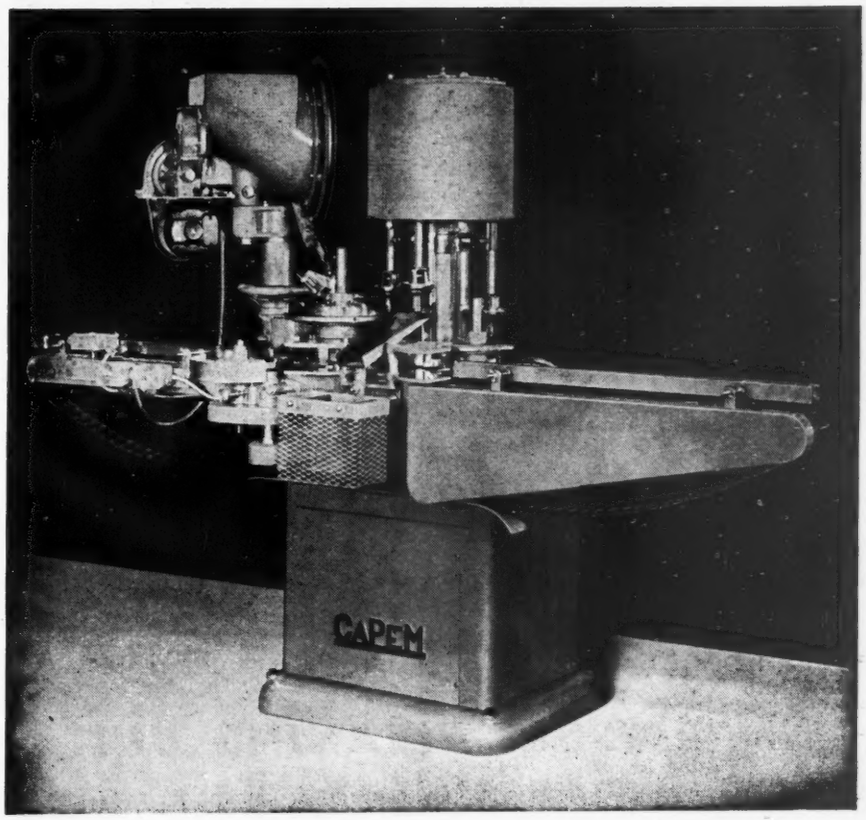
Only two flumes convey the peas from the separator-scale house to the cannery. One is used for Perfection and the other for Profusion variety peas. These two varieties are kept separate henceforth throughout the process.

Cannery Arrangement

With the exception of the lowest level in the plant (Level 8), where the can filling and seaming and the retorting is done, each of the unit operations in this plant is located on an individual level. The topmost level in the plant is used for salt and sugar storage. Three brine mixing tanks are located on Level 2. One tank contains the brine which flows first to the brine density regulators and thence to the quality graders. The other two tanks contain the brine and sugar, which are filled into the cans with the peas on Level 8.

CAPEM

THE MODERN SCREW CAPPER



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- Delivers a perfect, LEAKPROOF seal at low cost.
- Available in 1, 2, 4, 6 and 8 spindle models.

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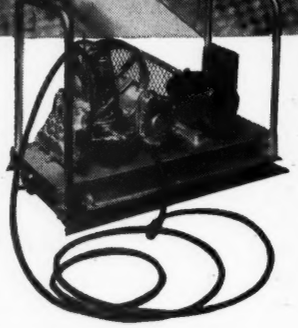

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FOOD PROCESSING MACHINERY

JUICE PRESSES • SPRAY COOLERS • CLEANING UNITS
TRIMMING TABLES • PASTEURIZER-COOLERS • CONVEYORS

Both brines flow by gravity—no pumps are needed.

The two varieties of peas enter the plant at Level 3 and each variety is flumed to its respective processig line. From the flumes, the peas enter de-watering reels and thence drop, by chute, into the washer-de-stoners. There are two types of sieve size-graders, located on Level 4, one incorporates its own de-watering device. The other grader is preceeded by a de-watering reel. Peas are flumed to the former and drop, by chute, from the de-watering reel to the latter.

Sieve Size Graders

A complex system of flumes surrounds these two graders. All of these systems flow toward Level 3, except the one which carries the peas to the next unit operation. There are four flumes on each side of the two graders. An operator selects the sieve sizes and the variety desired, then opens the gates to the storage hoppers under the graders, allowing the selection to drop into the particular flume that will carry it on into the process.

From these four flumes, the peas first move into de-watering reels and thence into the four blanchers, located on Level 5. From the blanchers, they drop into cooling-conveying flumes and move on to the three quality graders, located on Level 4.

As far back as 1894, a Colorado canner, W. H. Webb, was granted a patent for a machine that would separate peas according to their specific gravity. Employed was the factor of the peas being heavier or lighter than the brine used. This is still the basic principle used in machines and devices for grading peas.

Quality Graders

The Key Quality Grader (Food Industries, Vol. 19, p. 1499-1500) utilizes this principle of specific gravity, yet it has some design and operational characteristics differing from those of other graders.

De-watered peas enter the hopper at the top of the separation tank and are washed into the outside-conductor pipe. They flow down this pipe, strike a spreader, and enter the separator near its center.

The "floaters" (fancy peas) rise to the top of the tank and flow through a port into a de-brining reel. The "sinkers", (mature peas) drop to the bottom of the tank thence into a de-brining reel. The brine recovered from these reels flows to a scavenger reel, where it is separated from such refuse that may have accumulated. The waste is flumed to the sewer.

From the quality graders, the peas are flumed to de-watering shakers and thence to the picking tables (Level 7).

Here, operators handsort the peas, removing any foreign material or poor grade product that has escaped detection to this point. The peas then drop into storage-hoppers at the end of the picking belts.

Operators of the four can fillers, on Level 8, draw the peas from these hoppers as needed. From the fillers, the cans move to the can seamers. Operators take the closed cans and load them onto trucks, which are then moved into the sterilizing retorts. The canned peas are later cooled, labeled, cased and stored.

—End—

Better Oils

(*Continued from page* 109)

On the basis of color and a free fatty acid content of less than 0.05 percent, the quality of oil refined by the continuous caustic soda process is equal to that refined by the batch process. When the oils are double water-washed and vacuum-dried, the residual soap content is reduced to less than 20 ppm. and the moisture content to less than 0.05 percent.

Many users of the continuous process also feel that the oil has a better keeping quality than kettle-refined oil. In addition, the oil has a choice flavor and odor.

Our accompanying table, "Batch vs. Continuous", summarizes the results obtained from comparative tests of batch and continuous caustic soda refining of cottonseed oil. It illustrates lower refining losses and better quality oils obtained by the continuous method.

Provision for change in the treat at any time during operation allows greater flexibility of operation. The process can be operated by one man, thus reducing labor requirements.

Since the method is continuous and only requires a short processing time —three minutes instead of the 12 hr. by the batch method—a minimum amount of oil is tied up during processing. Washed and dried oil can be run directly to storage or processing without further filtration.

Adoption of the Process

Because of the increased yield of high quality refined oils, the continuous process has now largely replaced kettle refining of edible oils in the U. S. The economic advantage has allowed a high return on the investment made in equipment. In many cases, savings in operation have paid for the plant in a few months.

Cottonseed, corn, palm, peanut, soya, sesame, sunflower seed, linseed and kapok oils and tallow are being refined regularly by the continuous process in many plants throughout the world.

A TYPICAL "GEYER" FILLING MACHINE INSTALLATION

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SINCE 1914

SHOWN IN OPERATION A "Geyer" Preserve and Jelly Filling Machine.

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JELLIES	MAYONNAISE
CHEESE	PEANUT BUTTER
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Exhaustive research in the Wyandotte Laboratories is coupled with more than fifty years of experience in the production of up-to-date cleaning compounds to meet the specific cleaning needs of the food industry and many other industries.

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You can take advantage of these resources — and profit in doing so. Whatever your cleaning problems may be, you'll find the answer in Wyandotte service and the *complete* Wyandotte line. Why not consult your Wyandotte Representative today?

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WYANDOTTE CHEMICALS CORPORATION
WYANDOTTE, MICHIGAN • SERVICE REPRESENTATIVES IN 88 CITIES

Other oils which have been handled successfully are perilla, rapeseed, hempseed, wheatseed, raisin seed and walnut oils. Hog fat has also been refined by this method.

Plants with capacities ranging from 20,000 lb. to more than 600,000 lb. of crude oil per day have been installed and are in successful operation.

Acknowledgement is made to C. F. Simonin & Sons for the photos used in this article.

—End—

Candy Packaging

(*Continued from page* 115)

plied only a light seal to each cellophane-wrapped candy tablet. Most significant change, however, was in the 10-tablet wrapping machine. In place of the unit for the foil wrapper and label, a machine was installed to heat-seal the new, single wrapper.

Second step was to simplify the packaging operation without sacrificing the protective features of the new package. Simplification was accomplished by reducing the number of machines and operators on each line, as well as the floor space required for each line.

The old line had five machines and required seven operators, while the new packaging line has three machines and needs only three operators.

Operation of Lines

Here is how the old packaging line operated:

Candy tablets were fed by four girls on a conveyor to four tablet wrapping machines. Each machine wrapped and heat-sealed the tablets in cellophane at the rate of 150 a min. per machine. Next, two girls stacked the cellophane-wrapped candies in groups of ten, and fed them on a conveyor to the foil and label wrapping machine. These ten candy tablets were overwrapped in a paper-backed foil with a printed label that was glued. One girl then packed the consumer packages into display cartons—20 to a carton.

This is how the new packaging line works:

Two girls feed the candies to two candy tablet wrapping machines. Each machine wraps and heat-seals the candy tablets in cellophane at the rate of 300 a min. per machine, and then automatically stacks them in groups of ten tablets. A machine overwraps and heat-seals the ten-tablet unit in the special, printed, laminated foil wrapper. One girl finally packs the nickel-size packages into display cartons or a metal container.

Final step in the packaging opera-

tions is to overwrap and heat-seal the display cartons in waxed paper on a Package Machinery Co. wrapping machine, or to vacuum-seal the cans on an American Can Co. line.

To further cut packaging costs, Charms prints its own cellophane. Champion four-stage presses print one to four colors on 20-in. rolls of cellophane. Machines then slit these rolls to proper size.

Because the candy company prints its own cellophane, it has better control over its cellophane inventory. Consequently, little if any cellophane is held in storage for long periods, obviating the risk that it will deteriorate and lose moistureproofness. Furthermore, obsolete inventories are eliminated. For example, if a new line of candy is being put out, only enough cellophane is printed to take care of immediate production.

—End—

Chlorine Dioxide

(*Continued from page* 105)

bleaching unit where the reaction takes place.

Special difficulties encountered in designing the equipment are the flammability of sodium chlorite and the highly corrosive properties of the aqueous solution of the salt, as well as the corrosive property of the chlorine gas. Since existing connections between the meters and the bleaching units are of rubber, they should be adequate for use with chlorine dioxide.

Maturing Agents Compared

From the baker's standpoint, chlorine dioxide accomplishes essentially the same maturing effect upon the flour as does nitrogen trichloride. Doughs made from chlorine dioxide-treated flour are more elastic, and the bread from these doughs has greater loaf volume, finer grain and smoother texture than similar bread made from untreated flour. The degree of improvement is similar to that obtained when nitrogen trichloride-treated flour is used.

In most instances, the rate of treatment to achieve optimum maturing action is $\frac{1}{3}$ to $\frac{1}{2}$ the rates now used with nitrogen trichloride. However, at this optimum treatment level, color removal (of carotinoid pigments) is 15 to 20 percent less than that obtained at present with nitrogen trichloride. This means that an increase in benzoyl peroxide to an equivalent percentage will be necessary to maintain present standards of whiteness in the finished flour. The percentage of benzoyl peroxide required is 15 to 20 percent

THE CASE OF

THE "CERUSSITED" COCOA BEANS*

Late one night last spring one of our engineers received a hurried call from a large chocolate manufacturing concern. The company had received one hundred carloads of cocoa beans by marine shipment, only to discover that, due to a serious error in loading, the entire lot was contaminated with cerussite (lead carbonate occurring in colorless transparent crystals) the most poisonous of all lead ores.

The Food and Drug Administration detained the shipment and the receiving company was faced with the immediate prospect of destroying it unless an economical method of reconditioning and salvaging could be devised. (To be acceptable, the cocoa beans could not show more than 2/100ths of one grain of lead to be present per pound of cocoa beans).

Our S S & S product engineer recommended that the beans be scrubbed first. However, this operation could not be depended upon to remove wormeaten beans which might contain lead in the worm holes. The beans were then put over an S S & S Specific Gravity Separator which graded out the product according to particle density. Thus, by effecting a super-sensitive separation of the lighter contaminated beans from the heavier usable ones, over 90% of the one hundred carloads was recovered and passed after stringent inspection by the Food and Drug Administration.

**Third in a series of actual case histories describing the use of S S & S equipment to clean, reclaim, and up-grade agricultural products previously classified as being below commercial standards.*

The Case Of The "Cerussited" Cocoa Beans was no mystery to S S & S product engineers. Every hour in every day you'll find our Specific Gravity Separators and Air-Float Stoners serving the food industry with economical high-volume separations on virtually every type of product destined for human consumption. With 99.9% of heavy contaminations *(both magnetic and non-magnetic)* removed, processing equipment wear-and-tear is reduced; end products are upgraded to premium quality; hand-picking costs diminish toward a vanishing point. If you've got a tough separation or reclamation problem, let an S S & S product engineer have a crack at it. Check the details in our Bulletin FI-1048.

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DALLAS, TEXAS, U. S. A.

Sixty Years of Specialized Experience in Separations

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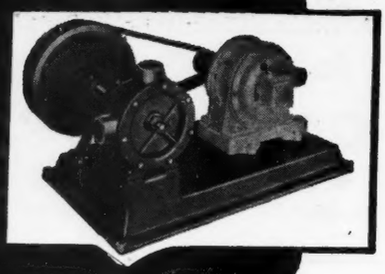
The Rotary Pump, Built To Create and Retain your CONFIDENCE



The building of a piece of equipment to win your confidence is the aim and purpose of every Viking that leaves the factory.

Confidence can only be *won* and *retained* with a pump that will actually go out and do the job it is sold to do.

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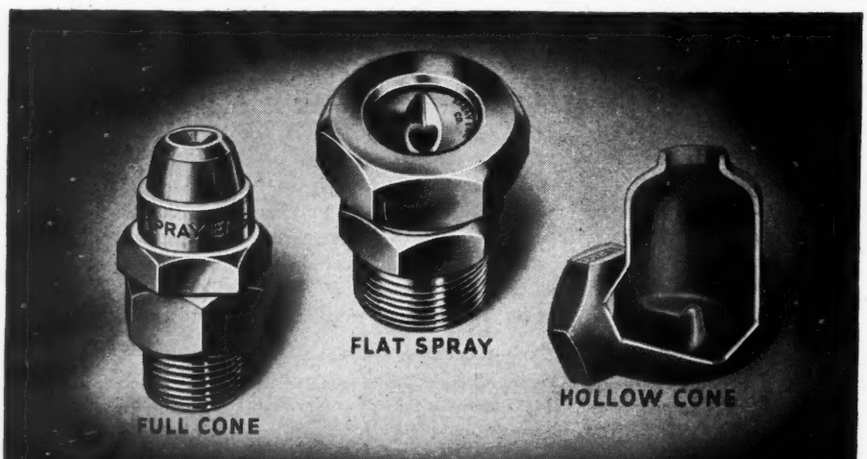

SPRACO NOZZLES

Write for NOZZLE CATALOG *to*

SPRAY ENGINEERING CO.

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greater than the quantities now used.

Present indications are that most grades of flour are more susceptible to over-treatment with chlorine dioxide than they are with nitrogen trichloride. Therefore, more care will be necessary in the application of the chlorine dioxide, also more sensitive metering devices than are required for nitrogen trichloride.

Pending action on the application and subsequent rulings by Federal Security Administration, flour millers are continuing their investigations of the gas relative to its properties and action upon the flour. Equipment manufacturers are working out details of design, and control over dosages to be used. The changeover, when and if it is made, will likely be spread over a period of 12 to 18 months, since tooling-up and the making of the equipment can not be undertaken seriously until a definite ruling has been made.

References

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2. Erich Staudt, British Patent No. 263,760. Jan. 12, 1928.
3. Willy Becker, U. S. Patent No. 1,910,741. May 23, 1933.
4. C. G. Ferrari et al., "Flour Bleaching with Chlorine Dioxide." *Cereal Chemistry*, Vol. 18, No. 6 (November 1941) p. 699.
5. Logan, U. S. Patent No. 2,163,793.
6. Cunningham and Losch. U. S. Patent No. 2,043,284.

—End—

Truck Bodies

(*Continued from page* 121)

ing conveyor and then forward toward the street to within reach of the electric lifting hoist running on the overhead I beam. It is then ready for the next step in the loading operation.

Delivery Cycle Completed

Returning from its delivery route with a load of empty bottles, the delivery cycle is completed by driving the truck to a predetermined spot indicated by marks painted on the curb. The electric hoist is then run out over the body on its overhead I beam; the body lifted about a foot off the chassis and then carried inside the building where it is lowered onto one of the waiting empty dollies.

Later the dolly and the body, loaded with empties, is pushed to the end point of a conveyor. This conveyor carries the cases to the starting point on the fourth floor. There a bar set across the conveyor at the right height turns the higher 24 oz. bottle cases into one line and lets the lower 8 oz. bottle cases pass through on another line. This divides the cases for the respective conveyor lines they are to follow down through the third floor and to

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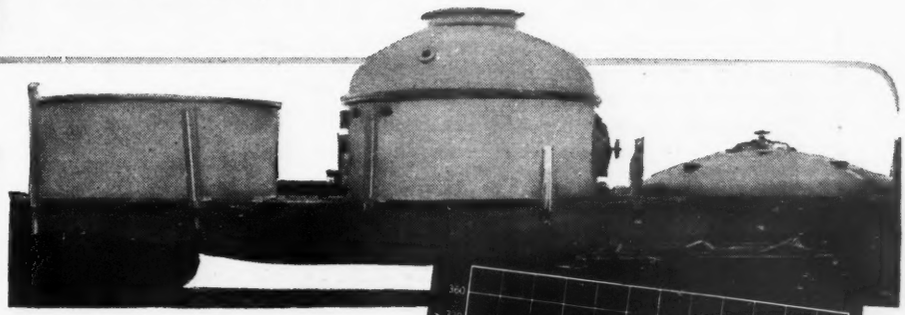
In processing foods . . .

NI-RESIST PERFORMS BETTER LONGER

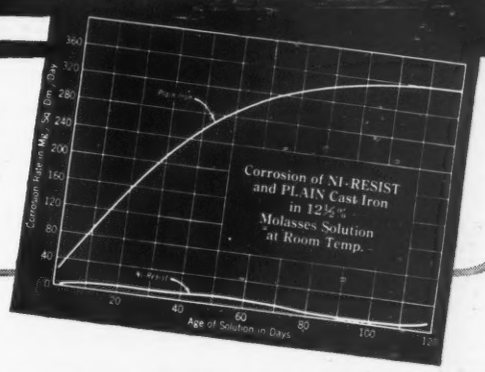
HELPS PROLONG MACHINERY LIFE

Ni-Resist*, a nickel cast iron alloy, provides a remarkable combination of properties. Its high corrosion resistance minimizes contamination and discoloration of processed products. In addition, it resists wear and moderate heat. Ni-Resist helps to prolong equipment life, while keeping product purity high.

36 TIMES MORE RESISTANT THAN CAST IRON IN FERMENTED MOLASSES



Look at the chart. Comparison of these corrosion rates shows the superiority of Ni-Resist over cast iron to be 36 to 1. This high resistance to corrosion in sugar refining processes has led to wide use of Ni-Resist for parts such as these large sugar retorts, produced by Kingsport Foundry & Manufacturing Corp., Kingsport, Tenn.



NI-RESIST SPECIFIED FOR HOBART DISHWASHER PARTS

Hobart Manufacturing Company, Troy, Ohio adopted Ni-Resist for various parts of dishwashing machines of the type shown here. Ni-Resist castings are used because of their exceptional resistance to the corrosive action of cleaning compounds.

Typical Corrosion Data Available From Publication "ENGINEERING PROPERTIES and APPLICATIONS OF NI-RESIST." (Use coupon below for your copy.)

Corrosive	*Typical Ratios of Ni-Resist Superiority over Cast Iron (1)* Cast Iron	Ni-Resist
Corn Starch	1	5
Grapefruit Juice	1	6
Margarine	1	45
Meat Juice	1	10
Pineapple Juice	1	11
Sugar Cane Juice, Raw	1	6
Tomato Juice	1	5
Vinegar Syrup	1	17
Whiskey Mash	1	5

(1) The corrosion data presented in "ENGINEERING PROPERTIES and APPLICATIONS OF NI-RESIST" is expressed in average corrosion rates in inches penetration per year and includes such additional pertinent data as location of installation on test, duration, temperature, aeration and velocity.

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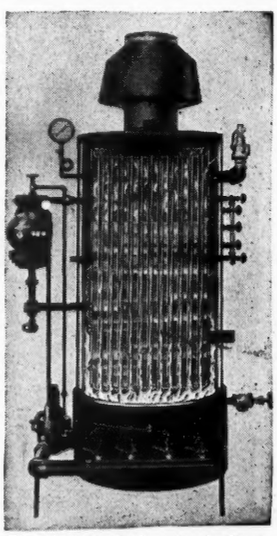
Engineered Steam at its best with four decades of experience at your disposal—so, send your steam problem to us for study and recommendation.

ENGINEERED STEAM AT ITS BEST



The KANE Boiler is built to A.S.M.E. specifications, in sizes to 30 H. P.

The M-K-O Automatic Boiler Feed returns condensate and supplies small quantities of hot water as needed to the KANE Boiler.

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FOUR DECADES OF AUTOMATIC GAS-FIRED BOILER MANUFACTURING EXPERIENCE

the case filling points on the second floor.

The bodyless truck on the street is then ready for the loaded body. The driver first turns in his signed delivery receipts from the previous load and has his empty returns checked. He next checks the tally sheet for his next load and returns this to the shipping office, which issues him sales orders in duplicate for his new load.

Speedy Operation

The body with the new load is then lifted off its dolly; moved out to the curb suspended from the overhead I beam, deposited on the chassis and the driver is ready to start. The entire unloading and loading operation averages only three minutes. In fact, as many as 30 trucks have been loaded in 1 hour, or at the rate of two minutes per operation.

To obtain such speed in performance, seven of the low-wheeled dollies are in use simultaneously. Six of the dollies carry truck bodies at all times. The seventh stands empty ready to receive the next incoming truck body. Of the six loaded dollies, four are in line at the loading stations; one carries the body being unloaded and one is kept beside the door with an empty body to provide flexibility or meet an emergency requiring the truck to be sent away without a load.

The body loads consist of cases of 8 oz. and 24 oz. bottles and tanks of ale loaded in the shipping room. Approximately 60 percent of the loads are pre-sold orders, which the drivers deliver and get receipts for without any selling on their part.

The demountable-body Vernor trucks are of the 1-ton rated models limited to loads of 1½ tons consisting of from 65 to 70 cases. They are driven by the driver only, in comparison with the 300 to 500 case loads of some two-man beverage trucks.

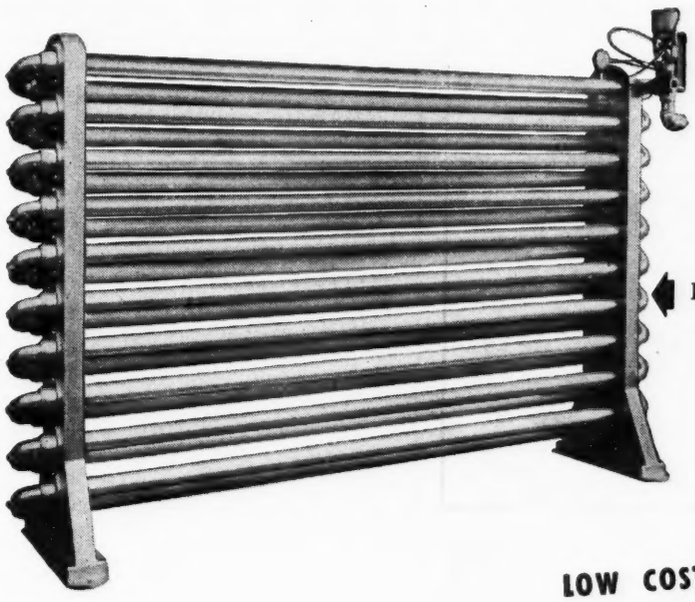
Economical System

However, with the small demountable body trucks making three or four trips a day and with deliveries of up to 280 cases—all with one man—the Vernor company feels that it has the most economical delivery system obtainable under the conditions as they exist at present.

Production in the Vernor plant is governed by the day's sales. This reduces the investment in the finished product. The combined flow line and delivery system tends to move merchandise out of plant immediately. An empty bottle, moving into the unloading station on a truck body, can be back on another truck body, filled and moving toward the retail outlet, within 45 minutes. It is such efficiency that has made these systems pay off.

How You Can
CUT YOUR PROCESS COSTS

with *Carpenter* STAINLESS TUBING . . .



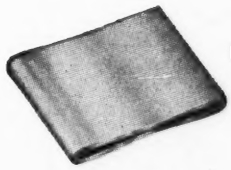
Your equipment costs less because this Stainless Tubing gives you immediate savings of 15% to 40%.

You get full corrosion resistance for your specific jobs. This Stainless Tubing gives you uniform wall thickness that permits the use of lighter gauges. You save dollars when you specify Carpenter Stainless Tubing.

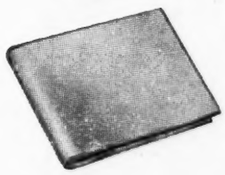
For proof that process costs can be cut today, get in touch with us, just as the manufacturer of this heat exchanger did.

High speed heat transfer and cooling, easy cleaning between runs and freedom from failures that cause wasteful down-time are reasons why Carpenter Stainless Tubing is used for this unit—3" O.D. x 16 gauge on the outside, 1½" x 16 gauge for inside tubes.

LOW COST FABRICATION and TROUBLE-FREE PROCESSING start with the Stainless Tubing that passes these tests—



FLATTENING TEST protects you against the possibility of O.D. defects. Specimen is flattened between parallel plates until distance between plates is 3 times the tube's wall thickness. Any sign of cracking or flaws is cause for rejection.



TRANSVERSE BEND is used to double-check the I.D. structure of Carpenter Stainless Tubing. Sample is slit longitudinally and then bent as in the flattening test, but in the opposite direction.

These tests, made at several stages of manufacture, prove quality of the entire tube section and are made on every lot of full finished Carpenter Stainless Tubing before it is released for shipment.

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USEFUL SLIDE CHART gives you information that has never before been available in such easy-to-use form. Data on Physical Properties, Velocity Constants, Mass Velocity Constants, etc. A note on your company letterhead will bring your Slide Chart to you.

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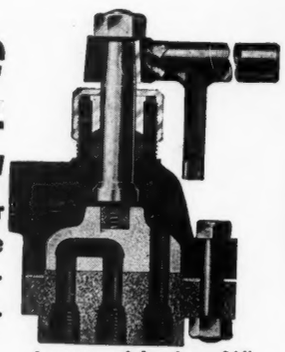
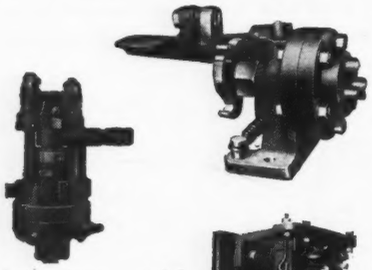
IMPROVE PRESSURE CONTROL

On or Off Instantly with 60° Lever Travel

Widely used as replacements for gate or globe valves, these fast Nicholson units save time and labor, and minimize the differential between opening and closing pressures.



Lever model: sizes ¼" to 2½"; press. to 500 lbs.



Left, lever model: sizes ½" to 2½"; press. to 5,000 lbs. Right, foot and solenoid models: sizes ¼" to 2½"; press. to 375 lbs.

METALS for ALL MEDIUMS

Choice of 6 metal combinations for the corrosion problems of all mediums: air, gas, steam, water, tar, oil, etc. Featuring special seats that don't cut out; easily repacked stuffing box; heavy bodies. Also a full line of 3 and 4-way cylinder control valves; and special multiport, distributing and proportioning valves. CATALOG 546.

W. H. NICHOLSON & CO.

193 Oregon St., Wilkes-Barre, Pa.

Acid-Type Fresh Cheeses

(*Continued from page* 124)

such a way that the final cheese could be pasteurized by the holding method in the cheese vat. This increased the life, or keeping quality of the cheese to almost double that of ordinary creamed cottage cheese.

This cheese, with the cream inside the curd, was made by the acid method and, due to the milks' soft curd character, the curd never became rubbery or grainy but always remained smooth and creamy to the tongue. This method of making creamed cottage cheese has now been declared illegal. It is, however, the ideal way from the standpoint of flavor, texture and keeping quality.

If we are permitted to look into the future it is possible to visualize a standardized, homogenized milk powder, complete for making creamed cottage cheese, for the use of manufacturers with limited equipment, or those located in territories with a small or no milk supply at all.

If we bear in mind that the per capita consumption of soft fresh cheese in the United States has increased during the last 25 years from ⅓ lb. to 2 lb. and then look at California with a per capita consumption of 11 lb., we have a right to draw the conclusion that the soft cheese industry has a wonderful opportunity for greater expansion and improvement for the benefit of the American public.

—End—

Source of Vitamins

(*Continued from page* 92)

vestigation of a large series of sterols and related compounds has revealed that ergostanol acetate is about as potent as the crystalline antistiffness factor. That there are still unidentified essential nutrients in milk seems to be indicated by the work of Cary and Hartman.

The status of flavanoid compounds (vitamin P) is receiving considerable attention. The recent isolation of vitamin B_{12} may open the way to important advances in the treatment of human anemias and may shed light on the "animal protein factors."

This does not exhaust the list of possibilities among new vitamins. It is obvious, however, that we are a long way from knowing what the value of these factors may be in the human diet.

Much remains to be done to expand the application of present knowledge of recognized vitamins. Let us hope that wisdom will prevail in the furtherance of this knowledge and in its exploitation for the public good.